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CONTENTS.

PAGE

List of Officers and Councillors v

Geographical Notes in Alaska. By W. H. DALL 1

Work in North Greenland in 1894 and 1895. By Civil Engineer R. E. PEARY, U. S. N. 21

The Internal Slave Trade in Africa 71

The Physical Geography of New York State. By R. S. TARR 99

The Alaskan Boundary. By MARCUS BAKER 130

Geography from Nature. By R. E. DODGE 146

Mountaineering in Alaska. By ISRAEL C. RUSSELL 217

The Indians of British Columbia. By DR. FRANZ BOAS 229

The American Association 245

A Graphic History of the United States. By HENRY GANNETT 251

The Topographic Work of the U. S. Geological Survey in 1895. By HENRY GANNETT 323

Mexico. By M. ROMERO, *Mexican Minister at Washington* 327

The Utmost Waters of the Missouri River. By J. V. BROWER 387

Record of Geographical Progress 54, 157, 273, 392

Washington Letter 37, 173, 290, 411

Book Notices 72, 189, 299, 428

Map Notices 181, 418

Accessions to the Library 80, 200, 309, 440

Transactions of the Society 95, 216, 455

The Cullum Geographical Medal 454

Index 457

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BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXVIII **1896.** **No. 1**

GEOGRAPHICAL NOTES IN ALASKA.

BY

WM. H. DALL, *U. S. Geol. Survey.**

At the last session of Congress the U. S. Geological Survey was required to report upon the resources in gold and coal of the Territory of Alaska, and a sum of five thousand dollars was appropriated for the necessary fieldwork. Dr. Geo. F. Becker was appointed to take charge of the party and report upon the subject of gold-mining, and the writer to investigate the deposits of coal and lignite. As the means provided and the time available were both so restricted as to render a visit to the Yukon placer mines impracticable, our investigations were necessarily confined to the coast, where nearly all the deposits of gold or coal, other than placers, are accessible by ordinary steamers or vessels specially chartered.

Our party, completed by the addition of Mr. C. W. Purington of the Survey, left Tacoma, Wash., by the semi-monthly steamer on the 23d of May, reaching Sitka about a week later. Here by the courtesy of the Navy Department, the U. S. S. *Pinta* was placed at our service for work in the Alexander Archipelago. A month was spent here, and then the party sailed on the steamer *Dora*, which carries the mail westward to Unalashka once a month during the summer. Leaving the *Dora* at St. Paul, Kadiak Island, a small steam-tug of about 11 tons net burden was chartered for work among the Kadiak Islands, in Cook's Inlet, on the south shore of Aliaska peninsula, and westward to Sand Point, in the Shumagin group; where we met the *Dora* on her August trip and were carried by her to Unalashka. Here a short trip was made to the Grewingk and Bogosloff volcano islands and return, and leaving Unalashka by the steamer *Bertha* we returned direct to San Francisco.

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* Published by permission of the Director of the Survey.

The geological and economic data obtained will appear in the publications of the Survey, but many years' work on a reconnaissance of this coast under the auspices of the Coast Survey has led me to the habit of noting such geographical data as seem new or interesting. Such notes made on the voyage form the basis of the present paper.

The Coast Survey, in connection with the demands of the boundary commission, has been engaged for some years in a reconnaissance of the coast and islands of southeastern Alaska, to the great amelioration of the charts of that region. During the summer tourist steamers visit the principal points of interest, and consequently the scenery and even the geography of the wonderful fiords, glaciers and mountains of the Alexander Archipelago have become pretty well known, and are described in numerous books of travel. For the explorer in search of new material, other than minor detail, opportunity begins with the voyage to the westward. The *Dora* is a sufficiently comfortable little boat and puts into a multitude of rarely-visited harbors, trading posts and passages, offering to the tourist who is not a victim of sea-sickness exceptional advantages. Yet I believe, so far, she has never had a passenger except those whose impelling motive was commercial or government business.

On leaving Sitka the mail-boat proceeds to the northwest through the narrow Olga Strait and Neva Passage, bordered by picturesque green islands densely wooded with spruce, the forest broken here and there by brooks and water-falls. The Pacific is reached through Salisbury Sound, whose shores, especially to the north, are remarkably high and precipitous. Here navigators must be on their guard against the so-called "woollies," sudden gusts diverted by the cliffs from the upper currents of air, and which descend with great force for a few moments, tearing up the surface of the sea until it is white as wool, whence the name, and are liable to capsize even good-sized vessels if not securely ballasted. These gusts often come down without warning, in fair weather, when it may even be calm at the sea-level, and are justly dreaded by seamen.

The seaward shores of the archipelago, north of Salisbury Sound, are little known. They are guarded by a multitude of wooded islands which protect numerous inlets and unsurveyed passages. The land is of moderate height and free from snow in summer. The water is deep, with rocky patches which afford excellent fishing. Becalmed off some of these islets in 1880 we caught the large red rock cod (*Sebastes*), a fish resembling the red snapper in general appearance, as fast as we could pull them in. Halibut also abounds in suitable places along this coast.

The proximity of Cross Sound is indicated by the appearance of tiny bergs borne by the ebbing tide from Taylor and Glacier Bays. They are fascinating objects in the sunshine, from the opaline tints of the ice, verging, in heavy masses, to the most beautiful robin's-egg blue.

North and west from Cross Sound, in clear weather, such as we were favored with, a panorama which I believe to be unique extends for two hundred and fifty miles. It is difficult to describe the Fairweather and St. Elias Alps in language which will not seem overdrawn. No language can express the sensations which the view affords to a lover of mountains. As mountains only the Himalaya can be compared with them for sublimity and beauty, and here we have not only mountains, but the sea. The principal peaks, like Fairweather, have a prismatic form, generally a sharp angular summit, with a lower buttress or shoulder on either side. The upper two-thirds are wrapped in eternal snow, the lower portions are wooded except where the numerous glaciers wind slowly to the shore. The foreland is narrow and usually rolling, sometimes a nearly level plain of glacial débris. Few of the glaciers actually reach the water, most of them stop short behind the beach. The sea hereabouts, for several miles from the shore, is generally covered with a thin milky layer of glacial water, the oceanic blue surging up only in the vessel's wake. In the Fairweather group there are numerous glaciers which in their upper slopes often take the form of ice cascades, the blue of the broken surfaces of ice conspicuous below the immaculate névé snow. This group is separated from the eastern extension of the St. Elias Alps by the wide ice-field called by La Perouse the Grand Plateau. Coasting within a few miles of the shore, as we did in 1874 and 1880, this seems an illimitable plain of ice; and was so described by me in the Coast Pilot of 1883. At a distance of ten or fifteen miles off shore, however, a relatively low mountain range is seen behind it, which I saw for the first time in 1895. Separated from the front of the Grand Plateau by a projecting spur, lies Dry Bay, a series of shallow glacial lagoons, in the midst of which rises a small, high, black rocky island with bluff sides and wooded top. Concealed by overlapping spurs of the range and sometimes blockaded by a temporary advance of the ice is the cañon of the Altsek River, a stream which rises to the south and east near the head of Lynn Canal and which has, on rare occasions, been descended to its mouth. It is absolutely concealed by the topography, viewed from the sea, and the sketch given in Tebienkoff's Russian Atlas must have been made from a verbal description, for it bears no resemblance to the reality.

Thence to Yakutat Bay, a glacial plain, intersected by lagoons and streams abounding in salmon, extends between the mountains and the sea, with a width of some ten or twelve miles.

At Yakutat, the old native settlement on the Port Mulgrave spit is now abandoned for another site on the mainland opposite. Here are several trading establishments, and a Swedish mission.

The new native houses are imposing from a little distance, being high frame structures with rows of false windows externally. Inside there is but a single story open to the ridge pole. The great increase in the value of sea-otter fur has supplied the means for these pretentious but shabby houses, which have neither the stability nor the dignity of the aboriginal log-houses. One native at the time of our visit had three sea-otter skins for which he had refused a cash offer of $900. He expected to get $400 apiece. One of these hunters was about to give a feast and had imported on the *Dora* boxes of Oregon apples and other fruit for the occasion.

In 1874 I gave one of these people an orange, the first specimen of a cultivated fruit ever seen in this part of the world, and which was taken away, with a sort of reverential awe, wrapped in a clean cloth to be exhibited as an extraordinary curiosity to his less fortunate neighbors.

The St. Elias Alps, westward from Yakutat to Icy Bay, have been well described by Russell in several interesting papers, and I have recently * given some account of the topographic and scenic features of the coast from St. Elias westward to Kaye Island. Before noting the new geographic features observed still further west, a few words on the cartography of the Gulf of Alaska and the Aleutian region are in order.

The earliest surveys which followed the rude sketches of the first Russian explorers, are due to naval officers in the service of Russia.

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* Alaska Revisited, iv, The Nation, Vol. 61, No. 1573, pp. 131–2, 1895.

Krenitzin and Levasheff and later Sarycheff did useful work, and the latter prepared a series of charts which were engraved on copper and issued early in the century both as single sheets and collected in an atlas. Subsequently work of a more modern type and excellent quality was carried on and issued in a series of several sheets by the Russian Admiralty, 1847–8. While wanting in details of inlets and the shore-line of many of the off-shore islands, these charts * represent an excellent reconnaissance and are in some respects still more reliable than any of those which have succeeded them. The United States exploring expedition under Ringgold and Rodgers in 1855 prepared an excellent chart of the Aleutians, which, however, was not issued by the U. S. Hydrographic Office until 1868. The navigators of the Russian-American Company brought in numerous local corrections to the central administration at Sitka, and these data accumulated until Capt. M. D. Tebienkoff, of the Russian Navy, who was acting as governor of the Colonies, conceived the idea of combining them in a new series of charts. Most of the contributors were German and Finnish seamen who had risen to the command of the company's trading vessels, but rarely were qualified for astronomical work. Their charts, therefore, while most useful for the navigator in these foggy regions, where seamen have to feel their way about by dead reckoning, were deficient in the precision of their astronomic data and rude in the execution of details. A rather remarkable circumstance was taken advantage of to fill out gaps in unsurveyed localities. The Aleuts, like the other Innuit people, have a remarkable capacity for drawing, especially maps of the region with which their hunting expeditions make them familiar. These maps lay down with the greatest detail every bend of the shore-line and every rock or reef where sea otters resort or a kayak might suffer injury. One may be certain that every item so placed upon the map has an actual existence, though its relative position may be distorted. By a very natural sequence, we find that the parts of the map adjacent to a village or camp are unconsciously drawn by the native artist on a larger scale than those portions of the same island which are less familiar and more distant. Topography is not attempted or is but rudely indicated, but everything which bears on the canoe life of these amphibious people is carefully set down.

I have several of these unpublished sketches, one of which is reproduced to illustrate their character. This particular sketch

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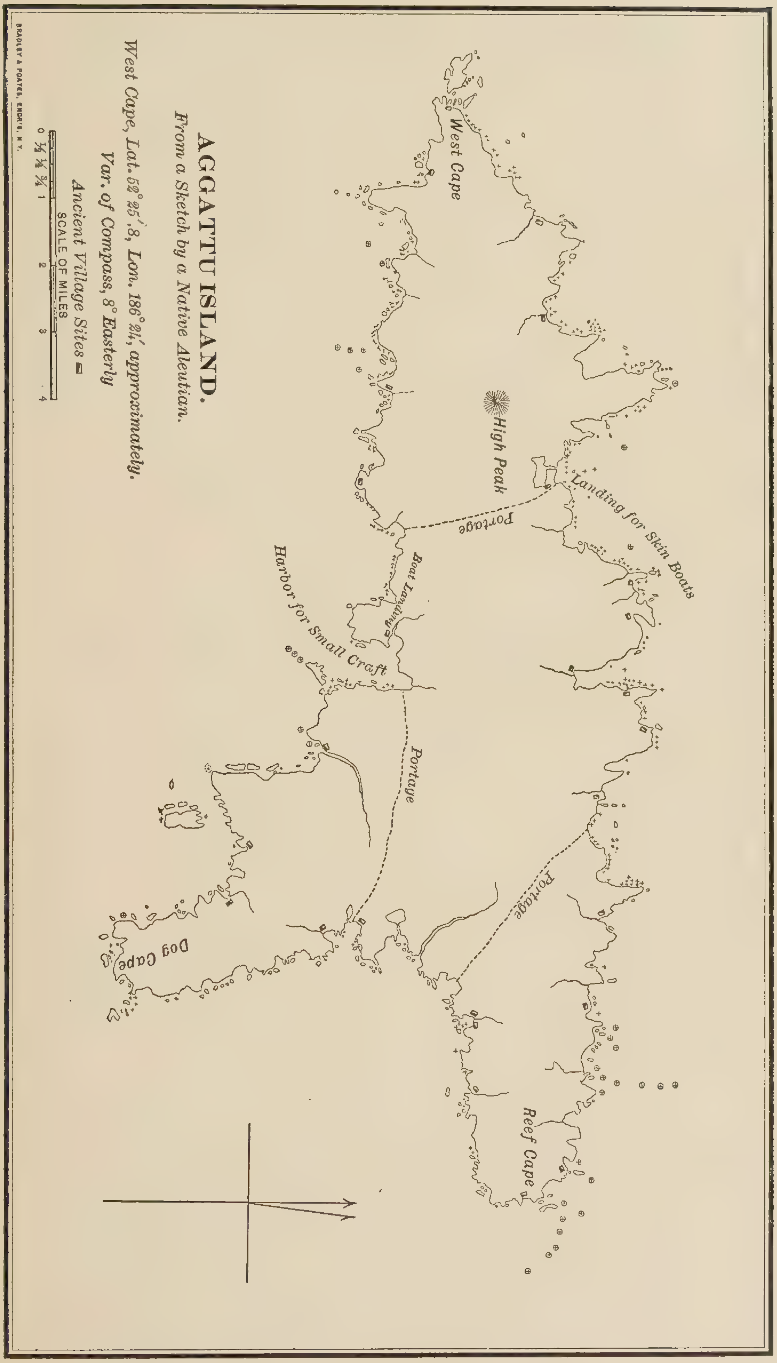
* Pacific Ocean Series, Nos. 7, 8 and 9.

represents the island of Aggattú, uninhabited, except by temporary hunting parties, for more than half a century, and still unsurveyed. When discovered by the Russians it was densely populated, and on the sketch a little rectangle takes the place of the cross by which the native draughtsmen marked the site of each ancient village. The original sketch was in pencil on a large sheet of brown manila paper. From this a tracing was taken on linen and this reduced by photography. On the linen were added (by me) the compass, approximate scale of miles, and lettering needed for explanation. Though the island has never been surveyed, its limits and the position of its west cape were fixed by the U. S. North Pacific Exploring Expedition under Rodgers. The scale is derived from a subdivision of the length given by Rodgers' chart, that being taken to be the same on both charts. The orientation is obtained in an analogous manner, and the astronomical position given is taken from Rodgers.

If the latter's chart is correct, the island is really more triangular and consequently of greater area. The natives practically confine their residence to the coast where they watch for sea otter. Consequently the relatively unfamiliar interior is dwarfed on their map. The coast with all its rocks, either awash or above water, kelp patches and islets, is represented in the most minute detail. As there is no permanent settlement and the natives hunt all round the island, the relative size of the different ends is probably less discrepant than usual on such maps. The original drawing by a native Aleut, who cannot read or write or speak English, was kindly lent me some years ago by Mr. Lucien Turner, who obtained it directly from the maker. I have similar sketches of the Semitchee and Attu Islands. Tebienkoff utilized quite a number of these Aleut sketches in his Atlas, adjusting them as far as possible by compass bearings and crude astronomical observations made by his navigators. His charts were engraved on copper at Sitka by a native Aleut, and the Atlas with a series of notes in the Russian language was issued at Sitka and St. Petersburg in 1852.

From 1868 to 1880 the U. S. Coast Survey were engaged in reconnaissance work in this region, with some sixty local charts of harbors and passages as a result. The general charts were compilations from previous surveys with local corrections.

The Tebienkoff charts were printed on very poor paper and rapidly wore out. After the American purchase of Alaska the navigators of the trading companies soon began to need charts, and a surveyor named Applegate prepared a number of manuscript


AGGATTU ISLAND.
From a Sketch by a Native Aleutian.
West Cape, Lat. 52° 25′.8, Lon. 186° 24′, approximately.
Var. of Compass, 8° Easterly
Ancient Village Sites ▪
0 ¼ ½ ¾ 1 2 3 4
SCALE OF MILES
BRADLEY & POATES, ENGR'S, N. Y.
West Cape
High Peak
Landing for Skin Boats
Portage
Boat Landing
Harbor for Small Craft
Portage
Portage
Dog Cape
Reef Cape

charts for this purpose. The Applegate charts were based on those of Tebienkoff, and were put together with mediocre ability, but contained additional data furnished by the company's masters from time to time; usually dependent on a few compass bearings and rough observations for position. They really formed a patchwork upon patchwork, and ignored the Coast Survey work almost entirely. In many cases sketches which had been adjusted in the Coast Survey work by triangulation, were adopted by Applegate in all their original crudity; and no reliance whatever could be put on the astronomical positions employed.

When the U. S. Str. *Albatross* began her fishery explorations on the Alaskan coast and in Bering Sea, in 1888, the officers on board under Capt. Tanner's direction made various reconnaissance surveys intended to improve the charts. Most unfortunately, in bringing the new work together, under the mistaken impression that the Applegate charts were an advance on those which had preceded them in point of accuracy, the *Albatross* work was combined with the Applegate maps as a basis and published in the Report of the U. S. Fish Commission without any such detailed explanation as would have shown what part was due to Applegate and what to the *Albatross* officers. Very naturally the U. S. Coast Survey hydrographers, taking the whole as vouched for by naval officers, incorporated the discrepancies of this compilation into their general series of charts for this part of Alaska, and have been followed to some extent by other cartographers. The result is a distinct deterioration in accuracy and a confusion which it is probable will not be corrected until an entirely new series of surveys has been carried out over the region in question. The corrections, which in the course of this paper I may be obliged to make, will be understood better by the light of the preceding bit of cartographic history.

After leaving Kadiak on a little tug of about 11 tons net burden, the first point of interest at which we touched was the uncharted harbor on the north side of Cape Douglas, the southwest point of entrance to Cook's Inlet.

This anchorage is included between the rounded, rather low peninsula of Cape Douglas, composed of mostly horizontal andesitic lava beds more or less interstratified with ashes containing plant remains,—on the east, and a narrower cape on the west and north, which is composed of a very level layer of subcolumnar andesite rising about forty feet from the top of the steep beach. On the upper surface are scattered occasional erratics. To the south three glaciers are visible, two coming down south of Cape Douglas and one ending in a stream which discharges into the southern part of the bight. The southernmost glacier is the largest. The shore about Cape Douglas is defended by numerous rocks and should not be approached too closely. Within the bay anchorage may be had in two to five fathoms under the west cape, where the bottom appears to be clear. The south and east parts of the bay are more or less shoal and rocky, and should be avoided. In entering, the navigator should keep the western shore aboard. Shelter may be had here in any wind except heavy northerly and northeasterly gales.

Leaving the cape, the northern slope of the mass of mountains behind it is seen to be snow-covered and with three very large snowy glaciers descending to the vicinity of the sea. The easternmost appears to be the largest, and showed an even snowy surface without lateral moraines. Northwest of the group of mountains is a space of comparatively low land crossing the peninsula behind the shoal and dangerous Kamishak Bay. Over these plains many caribou are said to range in summer.

Between Cape Douglas and Augustin Island, and about six or eight miles from the latter, are the Sea Otter Rocks, a low group not definitely placed on the charts. We steamed a straight course of NW. ½ W.* from the Cape in calm, clear weather, which, according to the latest charts, would have carried us directly over the rocks, but in fact carried us about two miles west from them. At low water there were two low, flat table rocks, with a smaller pointed one between them, visible at a distance of two miles, the eye being ten feet above the water. At high water they are said to be awash. We brought them in one with a high bluff, which we supposed to be Pt. Bede, on the east shore of the inlet, bearing NE. by E. These rocks constitute a serious danger to navigation.

Augustin Island (otherwise Black Fox or Chernobura) is a typical volcanic peak, with low borders of talus. At present anchorage may be had in three and a half fathoms, sand, about a mile off shore, with the south point bearing SE. by S., the western point NW., and the peak NE. by E. ½ E. The south point is low and sandy, but the boat landing is best here, the beach running off very shoal north of it. The west point is composed of ashes and volcanic stones, forming low bluff banks and running off in flats upon which the boulders of volcanic rock, sometimes very large, are irregularly distributed. No chart of the island exists. There was formerly an excellent harbor for small craft on the west side, and the inner harbor still exists, but the entrance is now dry at low water. This change was brought about at the time of the last eruption, less than ten years ago. That it was due to an elevation of the bottom and not to choking by the fall of erupted material, is evident from the presence of a number of more or less stunted spruce trees near the shore, which are evidently older than the eruption and would have been killed or buried by the fall of material sufficient to choke the harbor. The peak has the regular volcanic form, the rim of the crater being somewhat broken away on the west and north. Steam issues in intermittent puffs from the crater and inner cone, and when these puffs rise vertically and spread out like a mushroom above the peak, it is taken by the natives as an evidence of several days of calm weather, during which they do not hesitate to put out far from shore in their frail kayaks to hunt the sea otter. Dr. Geo. F. Becker and Mr. C. W. Purington of our party ascended the peak, which is some 3,000 feet in height. This was probably the first ascent which has been made, as there is no record of any previous visit by civilized explorers. The eruption referred to was accompanied by tidal waves and vast clouds of ashes, which were wafted to a great distance. On the west side of the inlet hundreds of square miles of spruce forest was killed by the load of wet ashes which descended on this occasion.

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* By compass.

The upper two-thirds of the peak are largely snow-covered; below much is bare ashes and scattered lava blocks; then more or less herbage, with stunted spruce, sparsely scattered, and low, creeping alders. The borders of the island to the south and west are low, hummocky, and with many bogs and small pools. The south shore has bluffs of variable height, none very high. The passage west of the island is foul near the island shore, but has a navigable passage rather closer to the mainland shore.

Our next anchorage was at Tūxed'ni* Harbor, between the peninsular shore and Chasik Island (properly Khasik, but locally indicated as Chisik on some charts), of which no chart exists. That a snug harbor is to be found here is noted on a sketch chart of the U. S. Hydrographic Office,† but that the bay is five or six miles long, free from dangers, and forming a spacious anchorage, would hardly be supposed from the very imperfect indications given on the best charts. Chasik Island is narrow, and rises over 2,000 feet in height, with bluff shores, the water bold-to. There is a small, round, high rocky islet outside of Chasik which forms a convenient landmark for vessels feeling their way along shore in fog, which sometimes conceals the entrance. The southern end of Chasik is high and narrow, with no reef or rocks off it, as has been erroneously stated. The strata are somewhat inclined to the south near the entrance, but in the main are nearly horizontal and composed of heavy beds of sandstone and conglomerate of varying hardness, so that the upper part of the island weathers into steps like terraces on a grand scale, offering a remarkable castellated appearance to the spectator. The scenery here is very fine and peculiar in its features. The splendid volcanic peak of Iliamna rises among the mountains SW. by W. from the harbor at a distance of some fifteen miles. Its upper part is set with glaciers, but the conical form and scenic beauty of the peak can only be fully realized from a greater distance. The fairway of the harbor is nearly straight, with high and singularly weathered cliffs rising on either hand. Toward the head it widens a little. Here good holding ground may be had in 18 fathoms. At this point the vessel which carries down the product of the salmon canneries from the inlet is anchored for the summer. The canned salmon is brought to her by small, light-draught steam tenders, which can cross the shallow water on the bars of the rivers at Kassiloff and Nenilchik, where the salmon are taken.

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* The correct form of the name was carefully recorded from native testimony.

† Notice to Mariners No. 4, Jan. 26, 1895, p. 50.

From Capt. Hughes we learned that the spring tide in June was 36 feet; at ordinary times the range is about 24 feet. The northern end of the harbor is protected by reefs and foul ground beyond Chasik Island, where there is a large, open bay. There may be a channel out this way, but until it is surveyed it would be imprudent to attempt the passage except with small craft. Into this bay a large river falls, fed by the glaciers of Iliamna and the drainage of the other mountains. The north end of Chasik shows high bluffs, rising much above those on the main shore, and above is a magnificent castellated summit of curiously eroded, almost horizontal, beds of sandstone, limestone and conglomerate, which can hardly be less than 2,000 feet in elevation. Near the beaches the rocks are worn into caves, arches and pillars, about which circle innumerable multitudes of sea birds.

There is no bar or obstruction at the entrance of the harbor, but the great range of the tides and the narrow form of the harbor produce well-marked rips at certain stages of the tide, which might lead to the supposition that rocks or shoals exist. On the island side the shores are bold-to, on the main, at the head of the harbor, shoal for a long distance from the beach. Notwithstanding the absence of protection at the entrance, southerly winds do not blow home into the harbor on account of the high land on either side; but, for the same reason, wind from the land is often stronger in the harbor than out in the inlet. July 23d, 1895, flood tide made shortly after 3 P.M.

All the navigation in the upper part of Cook's Inlet is commonly carried on with reference to the tides. A sailing vessel can make no headway against them, and it is the custom to anchor during the unfavorable tides, which can be done almost anywhere along shore. In pursuance of this practice, we anchored off the West Foreland, where there is a small village of Koo-tena Indians. Here the shore is of bluffs, apparently about fifty feet high, of gravel and sand, wooded above, with some high mountains distant in the interior.

We had slack water about 10 A.M., July 24, and started for North Foreland with the flood tide. Between the two Forelands is a wide bay, with shoal water and many scattered boulders rising out of it along the shore. The land behind is very low in part, all heavily wooded with spruce, and a river carrying very muddy water comes in here. Near the North Foreland is a series of whitish gravel bluffs of very regular height, with a broad beach and shallow water for a mile off it; with scattered—sometimes very large—squarish rocks of whitish color irregularly distributed over the flats. There are Indian houses in the principal gap in this series of bluffs, but the largest settlement, Tyónek, is near the point of the Foreland, where a small gravel flat exists. Here the water off the beach for half a mile is shoal, but not foul. Off the Foreland southward, in the middle of the inlet, most charts show an area enclosed by a dotted line connected continuously with foul ground on the southeast shore of the inlet. This is an error, as there is a clear passage on each side of the central patch, which latter trends with the inlet and shows at low water large, bare sand-banks, eight or ten feet high. East of North Foreland and between it and Point Possession, also in the middle of the inlet, is a flat or shoal not shown on the charts and which constitutes a serious danger. It is believed to be five or six miles long and not less than four miles wide, its southern edge about WSW.* from Point Possession.

The village of Tyónek is small, without a harbor, and the spot is inaccessible by sea in winter, as this part of the inlet freezes over. The tide is from 25 to 35 feet in range here, with a depth of 3½ fathoms half a mile off the beach.

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* All bearings in this paper are magnetic.

Turnagain Arm extends to the eastward from Point Possession and is the passageway to the placer mines, of which much has been said in the public press. Dr. Becker's report upon these will be published by the U. S. Geological Survey.

The following notes may have some importance in view of the influx of population and the necessities of navigation: Northeasterly from Pt. Possession on the continent the land is mostly low, formed by the delta of the Sushitna River, but at some distance inland rises a low but conspicuous peak known as Sushitna Mountain, west of the river, and a noted landmark. Eastward from the Sushitna another, the Knik or Fire River, enters the inlet north of Pt. Campbell. West of Pt. Campbell is a small, high island called Fire Island, to which sufficient water for an ordinary schooner may be had at low tide, according to local navigators. Both at Point Campbell and Point Possession the land is low and wooded, but about twelve miles eastward of the latter the mountains come to the water's edge, with narrow steep-sided ravines and cañons, in which are the streams where gold is washed. The land rises to about 2,000 feet; some of the peaks are perhaps higher, and the slopes are rather sparsely wooded. The rise and fall of the tide in Turnagain Arm is remarkable, and the middle of the passage, as well as much of its margin, is occupied by extensive flats partially dry at low water, with a shallow channel at each side. To enter the Arm and avoid the shoals keep Pt. Possession well aboard and steer for the northern edge of the high land on the south side of the Arm; keeping a little to the southward of a straight course between the two, and the lead constantly going, as the shoals shift to some extent. Allow for a tide of fifty feet in range, and select an anchorage in accordance with the circumstances of the case. The northern channel is not navigable eastward of Fire Island, and the island is nearer to Pt. Campbell and rather more southerly in position than indicated by existing charts. The shoal in the centre of the Arm is elongated, trending with the inlet and not rounded as on the charts. These shoals are mostly hard sand, with a few scattered boulders.

We anchored under the lee of a small, high, conspicuous rocky bluff, the first east of Pt. Possession, where the miners assured us there was always water enough to float our little tug. It is hardly necessary to repeat that here one can only move with a fair tide. At our anchorage, with the standard compass we found Pt. Campbell bearing W. 40° N., the north edge of Pt. Possession W. 10° N., the SW. edge of Fire Island in one with Pt. Campbell, Mt.

Sushitna NW. ½ W., and the bluff point a cable's length to the east.

We left North Foreland with the flood tide immediately after it turned at 2 A.M., July 25th, and at 8 A.M. found high water at the bluff above mentioned, with 41 feet of water under us. There was a slack of about fifteen minutes. At 9.15 we put out the patent log to test the strength of the ebb, and found it to average three and a quarter knots during the first half, though we were out of the strength of the tide. It was slack water at 3.30 P.M., and there was less than two feet of water under our bilge, showing a range for this day of 39 feet at this point. We were obliged to await the bore helpless on the sand, and it did not keep us waiting long, but came in with a rush in a wave three or four feet high, which whisked us a mile and a half up the inlet before we could get out another anchor; and here, with full steam ahead and both anchors down, we had all we could do to keep her from dragging. The log showed a seven-knot current, and the water after the bore had passed rose six feet in ten minutes. At extreme spring tides the ebb would leave this anchorage dry and for a mile or two seaward. The force of the current was such as to twist our main anchor, weighing 250 pounds and of good Swedish iron, in two different directions. It was a fit object for a museum when recovered. We were happy to leave Turnagain Arm with the turn of the tide. Off the high land west of our anchorage is a small, high island called Haystack by the miners. It rises out of the flats, which dry all around it at low water.

Two days later we entered Kachekmak Bay, on the eastern shore of the inlet. This locality is interesting on account of the presence of extensive deposits of brown coal, and because it is the finest harbor in the inlet, never obstructed by ice, and one of the finest on the whole Pacific coast. The native name of the bay is Kachekmak, in allusion to the high bluffs of the northern shore; the natives of Chugach Bay (Prince William Sound) in coming to the inlet made a portage from the Pacific to the head of this bay, and so reached the Russian trading post at Port Graham, so the traders called it the bay of the Chugachi, or Chugachik. The native name was misspelled on an obscure map without the central "k," and although the Coast Survey in the first and only special chart of the bay gave the correct spelling, the Board of Geographic names adopted the incorrect form, which thus becomes obligatory in all Government publications.

This harbor separates the comparatively level plateau of the

Kenai Peninsula west of its axial mountain range from a spur of that range which comes down to the sea at Pt. Bede, with several indentations affording anchorage.

These mountains are not very high, but from them descend several attractive glaciers not difficult to reach. One of these I had visited in 1880 and sketched its terminal moraine. On a second visit in 1895 I found it had receded about 250 feet from its old terminus. The rocks on this side of the bay are mostly crystalline or eruptive, forming a marked contrast to the bluffs of nearly horizontal sandstone and clays with conspicuous coal seams which border the opposite shore. The harbor is protected by a long, low spit of gravel, within which is good anchorage close to the shore, but the beach in front of the bluffs makes off shoal for two, or, toward the head of the bay, fully three miles. We observed the range of tide in the upper bay to be 22 feet; at springs the extreme range is said to be thirty in the upper part of the bay and somewhat less toward the entrance. Excepting a few buildings connected with the work of coal prospectors there is no settlement within the spit. In the lower bay outside of the harbor is a snug anchorage, Chesloknu of the natives, Seldovia or Herring Bay of the Russians. Here are two trading stations, and most of the inhabitants from Port Graham, where the harbor is less convenient, have migrated to Seldovia village. There is quite a collection of houses and a Greek chapel. No chart has been published of this anchorage except a small delineation from a Russian sketch which is included in the chart of Kachekmak Bay, compiled by the Coast Survey in 1880. The bluff at the SE. head of the entrance is composed of two small rocky islets united to each other and to the mainland by a low spit, so that the land is not continuously high as represented on the sketch alluded to. The entrance has rocky bottom clear across, with kelp growing in five and a half fathoms. The northern head is bluff and rocky, a rounded boulder lies off it, visible at low water. There are also rocks above and below water about the opposite headland. Inside there are seven and eight fathoms, sandy bottom, off the village in mid-harbor, with protection from all winds except NW., and at the head of the harbor complete shelter.

On the first of August we visited Amalik Harbor, behind Takli Island, on the south side of Aliaska Peninsula. We found excellent shelter from all winds and anchorage in ten fathoms sand. A long inlet penetrates the land here which has never been surveyed. The rocks are mostly coarse sandstones pierced by volcanic dykes, and contain seams of a superior quality of brown coal.

The next point visited was Cold Bay of modern charts (Studenaia or Frosty Bay of the Russians, Puale or Pūālū Bay of the natives), a fine sheet of water of which no charts exist and the indications on the general charts are very inaccurate. The entrance is partially obstructed by an area of foul ground, with rocky islets and pinnacles extending to the SW. from the northeastern point of entrance for several miles. Another patch, separated by a clear passage, is nearly in the middle of the entrance. The Russian Hydrographic Chart of 1848 shows these with more accuracy than any of the later maps, but barely indicates the inner shores of the bay. Cape Yaklok (Jäklok of some charts) forms the SW. headland and is free from off-shore dangers.

There is just within this cape a small spit of heavy shingle, with high rocky bluffs behind it. Here anchorage may be had in good weather, and the camps of sea-otter hunters are often made.

There is no settlement in the bay, which is divided into two arms by a high promontory near its head. The western arm terminates in low flat land, behind which is a large lagoon, dry at low water, into which empties a rather large stream. The land at the head of the eastern arm is higher. Most of the topography about the bay is high and barren, the rocks lying in nearly horizontal heavy beds of sandstone and conglomerate, which weather into benches and offer scenery of much impressiveness.

It somewhat recalls that at Chasik Island, but the mountain forms are more massive and simple, with long, even talus slopes, due to the disintegration of the rather friable shales, which are interbedded with the sandstones. Near the water the bluffs were curiously eroded by the sea and weather, and sheltered myriads of sea fowl. Singularly enough, though the rocks in hand appear brown or gray, the effect of them in distant masses was a marked brownish purple, giving the landscape a peculiarly chilly aspect, which well deserved the name applied to the bay. On the northeastern shore a stream comes in from a conspicuous valley, off which, on a gradually deepening flat, anchorage may be had in any depth desired. The water in most other parts of the bay is inconveniently deep. The shores near this place are of low bluffs of very massive light gray limestone, without fossils, which falls in enormous blocks, worn by the sea afterwards into very remarkable spheroidal forms. From the high land about the bay in windy weather heavy gusts sweep down, but the holding ground is good and the anchorage at this point sufficiently protected from the sea. The absence of trees gives an individuality to the landscape which is very striking when one comes from the densely forested slopes of eastern Alaska.

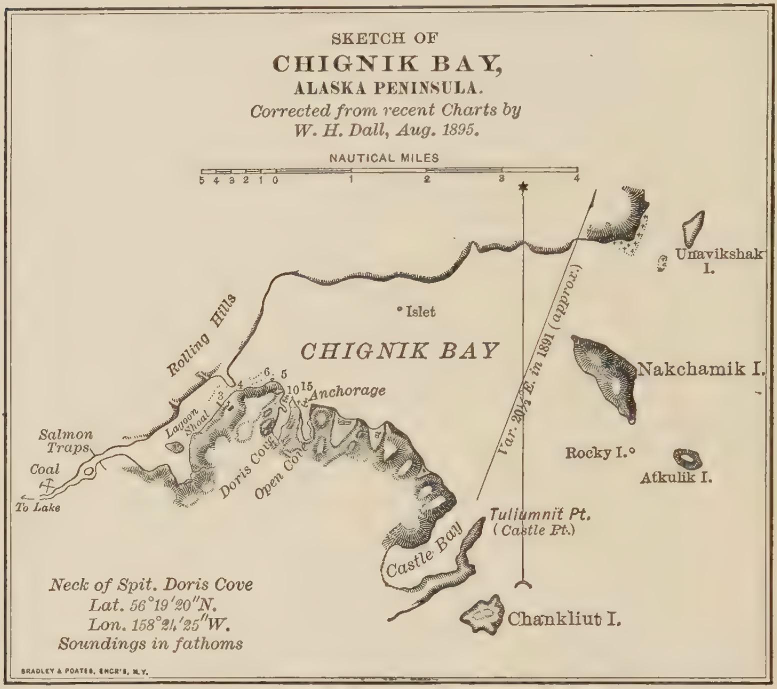
In Kialagvit Bay, further west, we have another large uncharted sheet of water, defended from the sea by a long line of islets. The indications of the general charts are very inaccurate. The bay at the eastward leading to the Becheroff village is clear of dangers, except near the points of entrance, where foul ground extends well off shore, and near the village where the water gradually shoals for two miles off the beach. There is no conspicuous mountain recognizable as the one on the charts near the village. The mountains resemble those of Cold Bay but, as the strata are inclined more steeply, do not show horizontal benches.

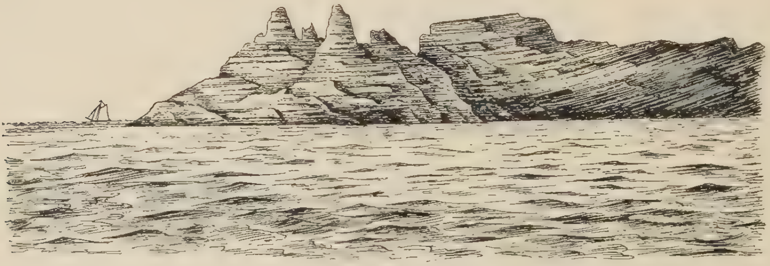
The entrance to the inner bay is rather close to the outer islets, with two or three fathoms over a bar. Within there are no invisible dangers and the water is mostly quite deep. There is a second entrance west of the first cluster of islets, with a clear passage and deep water according to a local pilot. There are several visible rocks there, but no hidden dangers. The portage to the Ugashik River of the northern slope of the peninsula, begins in a valley near the western end of the inner bay. At the extreme southwestern end rises the Olai volcano, from which on its eastern flank a large glacier descends; while on the seaward slope two others come down from the same *massif*. It is incomprehensible why all the charts should place Mt. Olai north of the bay and nearly midway of its length, since there is no volcano and no conspicuous peak in that situation. The mountains slope gradually toward the beach, covered with dense herbage, and near the portage is a notable locality for mesozoic fossils, where it would not be difficult to load a ship with ammonites.

Chignik Bay, still further west, is a better known locality, which has suffered exceedingly from the attempt to combine the Applegate sketches with the previously existing data. In this process the bay has, on the resulting chart, been reduced to about one-half its proper area, while the characteristics of its southern shore have been grossly exaggerated in relation to those of the east and north. Nakchamik Island, which lies off the bay, has been brought within half the proper distance of the northern part of the Semidi group, and the great lagoon has been represented as wholly sanded up.

Chignik Bay is sufficiently represented in the sketch here given to require no detailed description, but a few notes will be of use to navigators in advance of a fuller survey.

The bay opens to the eastward with no concealed dangers. Its south point of entrance is Tūliŭm'nit Point, a remarkable headland, sometimes called Castle Point, which forms a landmark for navigators in this vicinity. The sketch of this headland herewith, bearing SSW. one mile distant, is made from a photograph taken on shipboard by Mr. Ezekiel, of Woody Island, Kadiak, and kindly presented by him. The point is extremely narrow and composed of tertiary sandstones, forming a shallow syncline, the stratification





TŪLIŬM'NIT POINT, CHIGNIK BAY, SSW. I MILE.

being a conspicuous feature. North and west of the point is a deep indentation known as Castle Bay, unsurveyed, but which is said to afford anchorage on its northwest side. The grassy highlands west of the bay afford feeding grounds at times for the wild caribou, and by driving them on to the narrow point (which at one place is only a few hundred feet wide), large numbers are said to be secured by hunters. The south shore of Chignik Bay west of Castle Bay is bluff and high, with four indentations, the two to the east being closed by bars of gravel behind which shallow lagoons exist, while the two further west afford anchorage. The westernmost, named Doris Cove, is a snug and perfectly protected harbor and was surveyed by the U. S. Coast Survey in 1874. Here the vessel which serves the associated salmon canneries is anchored during the season. The extreme southwestern corner of the bay is marked by a round-topped vertical bluff, at the foot of which is the entrance to Chignik lagoon, protected by a long sandspit with a navigable channel between it and the bluff. Although this passage is represented on the later charts as entirely sanded up, there is a least depth of two fathoms on the bar and 22 feet of water at high tide. The channel is moderately wide, and inside the entrance offers three to five fathoms over sandy bottom as far as the canneries, beyond which the lagoon is shoal. At high water a three or four foot channel leads to the head of the lagoon where a river enters, at the mouth of which are the salmon weirs. A light-draught stern-wheel steamer affords transportation, and there is water enough in the river to permit the ascent of this boat several miles to a point where a seam of brown coal is worked by the association for use in the canneries. The catch of salmon from this single stream annually amounts to about five million pounds of fish. It was high water in the lagoon about 1.30 P.M. on August 4th. The river is bordered by vertical banks of tertiary rocks thirty or forty feet in average height. Two or three miles above the coal mine the river issues from a large lake, said to be six or seven miles long and connected with another, equally large, by a stream five or six miles in length. The topography is rolling, with low hills and a wide expanse of tundra on which caribou find grazing.

An important centre of trade, fisheries for cod, and gold mining, is found in the Shumagin Islands, at Delaroff Harbor, Unga, and Sand Point, a few miles above. The harbor of Delaroff village has not been surveyed, though a small Russian sketch was printed many years ago. It consists of an outer roadstead surrounded with rocky cliffs, where vessels may lay to a mooring; and an inner lagoon which has been stated to be silted up. We found, however, that good anchorage for vessels drawing not more than twelve feet may be had inside the entrance to the lagoon. This is important, as the outer bay is unsafe in southeast gales and several wrecks have occurred there. The anchorage is in mid-channel in three and a half to five fathoms, with a lee afforded by a reef and kelp patch on the south side of the entrance. A dangerous rock exists off the outer roadstead which I found to lie SE. by E. ¾ E. from the middle of the entrance to the lagoon. Going out we found the breaker in line with the trend of the point at the south head of the outer bay. From the inner anchorage the visible south end of Nagai bore E. by S. ½ S., the inner north headland E. by S. and the rock at the south headland S.E. by S. ¼ S. by compass.

A visit to the volcano islands Bogosloff and Grewingk, west of Unalashka, afforded many notes of interest, but my companion, Dr. Geo. F. Becker, in charge of our party, contemplates a special report upon these islets, so I will close these hydrographic notes by stating in the interest of navigation, that the long spit of ash and volcanic gravel which formerly connected the two volcanoes is now broken by a navigable passage (the existence of which has been recently mistakenly denied), directly over the spot where for more than a century Ship Rock of Cook towered in solitary majesty. The newer Grewingk volcano gives out but little steam, and the peak which at first surmounted it has fallen in or crumbled away until the upper part of the island is approximately level, or appears so from the sea. From the southeastern side of the island a long, low falciform spit extends, off which in fair weather protection may be had from westerly winds, and parties desiring to visit the volcano may, with care, effect a landing.

WORK IN NORTH GREENLAND IN 1894 AND 1895.

CIVIL ENGINEER R. E. PEARY, U.S.N.

When on the 28th of August, 1894, I pulled away in my whaleboat from the side of the ill-fated whaler *Falcon* lying to in Smith Sound off the Petowik Glacier, my feelings were not of the cheeriest, yet I had no reason to think that my chances of carrying out my cherished plans were, barring unavoidable accidents, other than good. Though the *Falcon* was separating me from those near and dear to me she was carrying them to safety and comfort, and she was leaving me with a small but experienced, effective, homogeneous and loyal party.

In the boat with me were one of my companions, Henson, and five of my faithful, trusty Eskimo allies, dusky children of the north. Nearly two hundred miles north, at the Lodge, at the head of Bowdoin Bay, was my other companion, brave, loyal Lee, awaiting my return. At the Lodge with him was an ample supply of all the essentials of life, except meat, requisite to carry us through the winter and early spring. Cached on the "great ice," at various distances of from twenty-six to one hundred and twenty-eight miles from the Lodge, were all (except a few minor) supplies needed for the white march across the "great ice" the following spring and summer.

My general programme was, as soon as I could have regained the Lodge, to proceed with some of my native allies to the deer pastures of Kangerdlooksoah and draw upon them for our own meat supply for the coming winter; then to levy tribute on the walrus at their feeding grounds in Omenah Sound for my winter supply of dog food. After that I would visit those of the caches upon the "great ice" located within a distance of fifty miles from the Lodge, dig them out, re-arrange them again upon the surface of the snow, and re-erect any signals that might have been broken off or blown down by the wind.

I should then endeavor to pass the winter leisurely working upon our equipment for the long sledge journey; exercising the utmost care to keep ourselves in physical condition, and conserving every energy, physical and mental, for a fight to the finish, when once again we attacked the "great ice."

All the time I recognized two eventualities which might defeat everything. The first was the breaking out of the Pibloktoo or epidemic dog madness among the native dogs, which, if the attack were serious, might almost exterminate the animals of the tribe and render it impossible for me to obtain dogs for the journey across the ice-cap. Second, the arrival of that end, which in the words of brave Horatius, of that other dauntless three, comes to each man soon or late.

I place the latter possibility second intentionally because without dogs it would be folly to think of attempting the conquest of the "great ice," while the reduction of our number to two would not necessarily mean the same. The journey to Independence Bay had once before been made by two, and there seemed no reason why it should not be made by two again.

As I stood in the stern sheets of my boat looking at the *Falcon*, her propeller began again its monotonous song, she swung on her keel, gradually gathered headway, and, threading her way among the bergs and floes, disappeared in the ice of the southern horizon.

Turning in the opposite direction, northward, toward the gloom of the coming Arctic night, for which my boat was heading, my eyes rested upon my Eskimo crew, pulling with all the strength of their iron-muscled backs, for the shelter of the bleak rocks of Cape Athol. A strange, wild, fur-clad crew, with dirty, greasy faces and coarse, matted hair, yet sturdy and faithful.

The brief Arctic summer was at an end and the lifeless gray sky hanging low over the icy waves of the North Water, and the black snow-capped cliffs of the iron-bound shore, made my crew as anxious as myself to reach the Lodge at the earliest possible moment, and lessen the chance of being caught in one of the violent storms which frequently mark this season of the Arctic year.

It was a curious coincidence that forty years (less half an hour) before, the "boat party" had left the *Advance* in Rensselaer Harbor in an attempt to reach Upernavik. That party was bound south, I was bound north, and the coincidence was more strongly accentuated by the fact that my first landing, twenty hours after separating from the *Falcon*, was at the place where that party had been stopped by the ice, and where they were obliged to build a small stone shelter in which they lived some three months until forced by starvation to retreat to the ship. In these twenty hours we passed the only critical part of our voyage, the wide and usually wind-swept mouth of Wolstenholm Sound, which, with its floating ice and tidal currents, would under unfavorable circumstances have been a very disagreeable stretch of navigation. Fortunately it was very calm at the time we crossed, and we reached and pulled along the "Land of Noogli," with the heavy north-water swell breaking in foaming thunder upon its low iron shore. From here I continued my voyage northward, and rounding the frowning black cliff of Cape Parry (Kangahsuh, the "Great Cape" of the natives,) entered Whale Sound, then coasted along the southern shore of this Sound into the river-like reaches of Olriks Bay to the deer pastures near its head to obtain some venison. The shelter of this bay was reached just in time to escape a violent southeaster which came rushing down from the frozen heart of the "great ice," swept over the crests of the cliffs in a blinding cataract of drifting snow, that mingled with the sheets of white spray torn from the water, till the entire Bay from water to mountain summit was a roaring, surging Arctic inferno. Nine days after leaving the *Falcon* I reached the Lodge.

The new ice was now rapidly forming in every place where the water was not constantly agitated by the wind, and it was only after the most arduous efforts that I got my boat within five miles of Falcon Harbor, where it was hauled out, and we walked overland to the Lodge.

There was no time to lose, and in twenty hours after our arrival Henson was on his way with the Eskimos to Kangerdlooksoah for deer.

Immediately upon his return Lee and myself started for the walrus grounds, where I harpooned and secured seven of these animals, and on the last day of September the final load of this meat and blubber and all our venison was safely housed. Space does not permit a description in detail of these walrus hunts. Any one in search of the excitement of bagging big game, will find it in the superlative degree in harpooning walrus. The setting of the scene is savage in the extreme: the barren snow-covered shores, tenfold more dismal and desolate in the sombre twilight of the Arctic autumn, the dead white, ghastly ice floes and spectral bergs driven here and there by winds and currents, and the black water swirling between. To creep among these bergs upon a herd of walrus stretched upon an ice pan, and as the huge half-frightened, half-enraged brutes plunge for the water, to spring to one's full height and with a motion that calls every muscle from toe to neck into play, hurl the flying harpoon at the nearest, then throw the coils of line over board as the harpoon quivers in the armor-like hide, will string the nerves to such a pitch of intensity, that when a moment later the sinuous, flexible harpoon line, the end of which is fastened to an iron bolt in the bow of the boat, becomes a vibrant rod of steel singing like a great æolian, and the boat, with the foam hissing from her bows, goes tearing wildly through the ice in tow of the great maddened brute, every fibre of one's body will be in unison with the singing line.

The next event was the search for the caches of provisions which I had left up on the inland ice the previous spring. Had it not been imperative that I should first assure my winter's meat supply for both men and dogs, I should have searched for these caches immediately after my return from the ship; but there had been no alternative left me. Now, was the first opportunity. With Matt, one of the young Eskimo men who rejoiced in the name of Maksangwah, but who was more familiarly known as "Flaherty," and ten of my best dogs, I started to accomplish this work. It was very late in the season now; we had but a few hours of daylight, and work upon the ice-cap could be prosecuted only under serious disadvantages. The first day's march on the "great ice" was, however, satisfactory, and I camped at night with sanguine hopes of finding my caches on the following day. The next day we reached the site of my first cache, but before we could begin the search for it it began snowing with every indication of one of the severe south-easters which characterize the beginning of the long Arctic night in this latitude.

So discouraging were the atmospheric prophecies to my Eskimo companion, "Flaherty," that after the tent was pitched and while Matt and myself were inside arranging the sleeping bags and putting the cooking apparatus in commission for our supper, he seized the opportunity to beat a retreat for the Lodge. Though very much irritated at the moment, I was afterwards glad that he left us when he did. Poor fellow, I learned afterwards that it took him four days to reach the Lodge, arriving at the end of that time so weak with hunger and cold that he could barely crawl.

As for ourselves, after making every preparation for the protracted storm, which long experience on the "great ice" told me was now upon us, Matt and myself turned in.

Reluctantly I resigned myself to the inevitable prospect of another of these dreary storm-bound episodes upon the "great ice"; only hoping that I might be as fortunate as hitherto in sleeping away the majority of the long hours. All night and during the next day the monotonous music of the storm continued. Late in the afternoon the wind slackened a little, enabling us to get out of the tent, feed and untangle the dogs, and muzzle several suspicious characters that might be expected under the influence of that arch devil of mischief and destruction which in storms on the "great ice" possesses the Eskimo dog, to chew up harnesses, traces and each other.

Then another and another and another similar night till six weary gnawing nights and days, the most accursed I ever spent upon the "great ice," had crawled their slow lengths into the past. At last came the cessation of the storm and hastily digging out tent and sledge from the drift, we harnessed up the dogs and began the search for the caches.

I feared from the first that this search would be unavailing, for during the six days' storm, over three feet of snow on the level had fallen. Yet through every minute of the precious daylight we diligently quartered the surface of the desert of snow, straining our eyes in the effort to detect a bit of the poles which had been left to mark the position of the caches, still projecting above the snow.

All our efforts were in vain. All of my essential supplies for the coming sledge trip, a total of nearly a ton and a half of provisions, had been swallowed up beyond recovery by the insatiable ice-cap. I was almost stunned by my loss; I felt like a man shipwrecked upon an uninhabited shore with nothing left him but the clothes upon his back. With the return from the ice-cap in this pleasant frame of mind began the long winter night. While on the ice-cap 6,000 feet above the level we had several hours of daylight; down at the Lodge at the sea-level under the shadow of the mountains, the duration of daylight at noon was but an hour or two. We were already on the confines of the valley of the shadow of death; the great, the indescribable night of the Arctic.

With the commencement of the Arctic night begins the monotonous hum-drum house life of the Arctic explorer. The hardest, and even under the most favorable circumstances, dreariest time of all for him. We entered its gloomy depths under doubly unpleasant conditions.

The loss of my caches had been a blow which dazed me for a time. We had been badly enough off before in regard to equipment, having only odds and ends and wreckage, so to speak, from which to evolve it; all the flower of my material having been expended on the first attempt and the fall work of 1893. I had, however, seen my way clear to obtain from the material at hand such an equipment as I believed would meet our requirements.

Now practically all of my provisions were gone. To understand how almost hopeless this loss made our projected journey seem, I will go into detail.

All of my pemmican and alcohol, the two prime essentials of Arctic sledge work under any conditions, and doubly so for ice-cap work, were lost. All my compressed pea soup, which on the previous journeys had proved such a valuable adjunct of the pemmican, was gone. Nearly all my biscuit and milk ditto. Of one thing only had I an ample supply still left, compressed tea.

What should I, what could I do? and yet the idea of abandoning the journey even in the face of this apparently overwhelming disaster, never for a moment occurred to me, nor I think to either of my companions. It would be necessary to revert to first principles as to our rations, revise our programme, and then leave the result to the Almighty.

An account of stock at the Lodge showed the following as regards rations:

Raw, frozen venison for ourselves, and frozen walrus meat for our dogs must take the place of pemmican; and coal oil must serve as a substitute for alcohol.

We could make out full rations of tea, biscuit, oil, and meat, as above for ourselves and dogs for two months, *i.e.*, sufficient for the journey to and from Independence Bay under favorable circumstances; and have some tea, biscuit, and oil, still remaining for use beyond that point.

For dog food and our own meat rations beyond that point our entire dependence must be upon the country beyond the ice-cap.

I had on the previous expedition demonstrated that one pound of pemmican per dog and three-fourths pound per man per diem would keep both in good working condition. The values of walrus meat and venison for such work were unknown quantities, though unquestionably much inferior to pemmican, yet I felt that we stood at least an even chance of reaching Independence Bay, and that chance we would take. Beyond there everything would depend upon circumstances, and by a favorable combination of these we might yet accomplish something.

Heavily handicapped at best, my chances for accomplishing anything beyond Independence Bay depending entirely upon the most fortuitous combination of circumstances, my haunting fear was that something would happen to prevent our even starting from the Lodge. Had the problem before us been merely the passing of the winter in comfort and safety I should not have had a care. As it was, my favorite nightmare during the winter was to dream that I was back home again without having been able to make another attack upon the ice-cap, and I would waken with a feeling of positive relief to find myself stretched on my bearskin with the howling wind of the great night tearing at the house, and to realize that I still had the struggle before me. That I had reason for this fear will be understood from our utter lack of any margin for accidents or mishaps, either to ourselves, our material or our supplies.

Should the dog madness descend upon the dogs it would end everything completely; should I happen to be disabled it would result in the same way. Should Lee or Henson meet with an accident or be taken ill and die (and we had no doctor) it would be a crushing blow. Should the house catch fire and our material or scant sledge supplies be destroyed it would cripple us.

And I had reason for these fears. Lee came home from an October surveying trip so used up that it took weeks to get him in shape again. Matt entered the New Year with an attack which here would have been called the grip, and I, going out to lash down a sledge in one of the furious winter blizzards, was nearly brained by a heavy box of frozen meat which, blown from the roof, just grazed my temple and struck a glancing blow upon my arm, rendering it useless for a week. I should have liked to put my comrades in fire and burglar proof safes and had them fed with a spoon, until the day arrived to start upon the ice. This was impossible, however, and instead we travelled as much as we could, utilizing each of the three winter moons for this purpose.

During the December moon Lee and myself went to Cape York, leaving the Lodge on the 10th and returning on the 24th. During this sledge trip, made in the depth of the Arctic night, we experienced no serious discomfort except during the last return march, when we travelled for 46 hours without food or sleep and were in no special danger except for a few moments while rounding Cape Parry, when a big berg capsized, breaking the ice about me, and I narrowly escaped being engulfed with my team.

One of the main objects of the trip was to determine accurately the positions of the prominent points of this coast, as Capes Parry, Athol, York, Conical Rock, etc., etc., but the frozen condensation from the North Water, which was steaming like a huge black cauldron, shrouded the coast in a silvery veil and rendered the stars invisible most of the time. After the sun returned in the middle of February, one of us was in the field all the time, Lee continuing his traverse survey of the shores of Whale Sound and its tributaries, Matt hunting, and myself visiting the settlements and obtaining dogs and other articles necessary to complete our equipment.

At last the day arrived to which I had looked forward and for which I had planned so long, the day set for the departure upon the journey across the "great ice."

What a striking illustration of the law of the failure of reality to equal expectation! Though at last in the position for which I had so long worked, I was terribly handicapped. Equipment and rations were both make-shifts, devised to the best of my ability from the scant means at my command, and many times when at work upon them was I reminded of Robinson Crusoe devising his boat and its simple fittings from material ill-suited to the purpose. I was, however, better off in equipment than in provisions.

Experience and ingenuity could make up for deficiencies in the former, but nothing could take the place of the alcohol, pemmican, and pea soup. So heavy was this handicap that it more than made up for our perfect training and fitness, and our complete experience.

And here let me correct an impression which I have found current in some quarters in regard to the loss of my caches which caused this heavy handicap.

It has been assumed by some that my caches were lost because I failed to properly determine their position. The actual fact was that my caches were completely submerged in an almost inconceivable deposit of nine feet of snow on a level, which left absolutely no vestige of them above its surface. The one cache which was found had been dug out of the snow during the summer and the pole marking its position reset.

This cache was 42 miles from the Moraine, and the circumstances attending its recovery were interesting.

When I reached the point where, according to my reckoning, the cache was located, I stopped the sledges and sent my Eskimos out with their dogs to quarter the surface of the snow-plain in every direction in search of trace of it. In less than five minutes a sharp-eyed, keen-scented dog made a dash at an almost invisible spot on the snow, which proved to be about three inches of the top of the signal pole still projecting from the surface, but rendered invisible from every direction but one by a tiny drift. It was within one hundred yards of where I had stopped my sledges.

The details of the march to Independence Bay and return have already been told in these pages, and it is not necessary to repeat them here.

When we started on this journey we knew that we were relying solely upon our own exertions and the Almighty. Whatever fortune, ill or good, awaited us in or beyond the heart of the "great ice;" whatever accident or mishap befell; there would, there could be no rescuing party. And even if we returned in safety, if the trust which I reposed in my Eskimo friends was ill-founded, we might find our house and stores appropriated, and ourselves left destitute.

Those who remember my journey in 1891 will recall that on the upward march, in my effort not to make any more easting than was absolutely necessary, I was repeatedly turned from my course by the unexpected penetration of the glacier basins of the great fjords of the northwest coast of Greenland into the interior, and in this way experienced much delay and annoyance. On my return the same year I went well into the interior to avoid these obstacles. In this I succeeded. With two routes having the same starting and objective points, and enclosing between them an elongated elliptical area, it was evident that an intermediate route on my next journey would not only be somewhat shorter, but would avoid the crevasses and steep slopes of the one route and the deep soft snow of the other. This I found to be the fact, and after the experience of the upward journey I was able to modify the return route still more with the saving of a few miles and an improvement in the travelling. A comparison of the four profiles between Whale Sound and Independence Bay is very interesting and brings out the relief of the "great ice" in a very clear manner, showing that it is really a very much flattened mountain system in ice, with its main backbone, its radiant spurs, and its intermediate valleys.

The first journey was near enough to the edge of the ice to cross the great basins of exudation, if I may use the term, and their intermediate divides, and the profile shows a succession of ups and downs like those of a railroad located along the foothills of a mountain system. The profile of the return journey of the same year shows but one depression, and that in the Humboldt Basin. The profiles of the two journeys of 1895 are ideal in that they show a rapid ascent from Bowdoin Bay to the surface of the central ice mass, and then a gradual gradient along the western slope of the continental divide till the summit is reached about 180 miles from Independence Bay, when the descent is rapid to the edge of the ice. That the crest of the Greenland continental ice divide is east of the country's median line there can be no doubt. Where it is crossed on the way to Independence Bay, it is trending away to the northwest and rapidly decreasing in altitude, to lose itself in the landward slopes of the "great ice" near the convergence of Victoria Inlet and the northwest coast.

From this continental divide extend spurs into the Cape York Peninsula, Prudhoe Land, Washington Land, Hall Land, etc., and between these divides are the enormous basins which feed the glaciers of Melville Bay, Inglefield Gulf, Kane Basin, Petermann and Sherard Osborn Fjords. The experienced navigator of the "great ice" has, like his brother of the sea, the means of avoiding or overcoming adverse conditions. If he has come in too close proximity to the land, and finds himself among the rocks and breakers—*i. e.*, crevasses and steep blue ice slopes—he must put to sea at once—*i. e.*, swerve into the interior.

If, when well out to sea, he encounters continuous adverse winds and currents and heavy sea—*i. e.*, up grade and deep soft snow—he can avoid them by veering toward the shore, when he will at once reduce the grade, and in a short time reach hard going.

One thing very much in favor of the navigator across the northern inland ice of Greenland is the fact that he will encounter practically no head winds. The regularity of the winds of the "great ice" of Greenland, as I have found them during an actual sojourn of over seven months upon the "ice-cap," and visits to it of greater or less duration in every month of the year, is phenomenal. Except during atmospheric disturbances of exceptional magnitude, which cause storms to sweep across the country against all ordinary rules, the direction of the wind of the "great ice" of Greenland is invariably radial from the centre outward, perpendicular to the nearest part of the coast land ribbon. So steady is this wind, and so closely does it adhere to this perpendicularity, that I can liken it only to the flow of a sheet of water descending the slopes from the central interior dome to the coast. The direction of the nearest land is always easily determinable in this way; the neighborhood of great fjords is always indicated by a change in the wind's direction; and the crossing of a divide, by an area of calm or variable winds, followed by winds in another direction, independent of any indications of the barometer.

The opinion previously formed by me, that the wind with its transporting effect upon the loose snow of the ice-cap must be counted as one of the most potent factors in preventing the increase in height of the ice-cap, a factor equal perhaps to the combined effects of evaporation, littoral and sub-glacial melting, and glacial discharge, has been corroborated and greatly strengthened by my observations of the past two years. When it is remembered that the flow of the atmosphere from the cold heights of the interior ice-cap to the lower land of the coast is going on throughout the year with greater or less intensity, and that a fine sheet of snow is being thus carried beyond the ice-cap to the ice-free land at every foot of the periphery of the ice-cap, it will perhaps be seen that the above assumption is not excessive. I feel confident that an investigation of the actual amount of this transfer of snow by the wind is well worth the attention of all glacialists.

The land clouds of the Independence Bay region were visible at least one hundred miles in upon the ice-cap, gradually rising above the snow horizon as we approached. When we reached what might be called the actual crest of the ice-cap, a point about fifteen miles from the edge, where it begins to slope down rapidly to the land, and I could make out the familiar land-marks, I found that we were approaching the land on a course about five miles east of that on which I had descended to it in '92. This difference of position resulted in a higher elevation, enabling me to look over the eastern edge of the Academy Glacier Basin and make out the summits of the east coast land ribbon considerably farther to the south than I had seen them in '92. At this time it was entirely clear on the ice-cap and along the inner edge of the Independence Bay land. Farther out was a heavy, hazy stratum, hanging at a considerable elevation over the land, beneath which I saw due north of us, and distant apparently seventy-five or one hundred miles, what had escaped observation owing to the heavy clouds on my previous trip, a magnificent mountain, massive in form and heavily buttressed, towering in savage grandeur far above the intervening cliffs and ice-caps. Apparently it was twice their height; as, however, its shape was changing under the mirage effects of these high latitudes, it is very likely that its elevation was exaggerated by the same cause. Increasing haziness soon hid it from our view, a few hours later a dull veil formed, entirely blotting out the sky, clouds sank in great leaden masses on to the land, the ice-cap took on a ghastly hue, and short, sharp gusts of wind followed each other in rapid succession down the slopes of the "great ice," and the land was reached in the midst of a roaring blizzard from the ice-cap which confined us upon the moraine for two days.

In 1892 my route from the moraine to Navy Cliff had been selected with a view to giving me as good an outlook as possible, and I had travelled intentionally along the crest of the mountains which bound the Academy Glacier on the west. Now my chief object was to get the sledges to the bay ice by the easiest practicable route, and this meant following the valleys of the streams, where the greatest amount of snow was to be found and the grade certain to be more regular and gradual. For this reason during our work upon the Independence Bay land, hunting the musk ox and transporting the sledges and equipment to a point about ten miles north of Navy Cliff, we saw only the slopes of the valleys which formed our road. When the unpleasant fact dawned upon me that our efforts had practically been futile, and that it would be folly to proceed farther, I ascended with some difficulty to the nearest eminence to see if I could make out anything more in regard to the features of the region. Where I stood, and from there east and north-east out through the Bay, the sun was shining brightly on the unbroken expanse. From my more advanced position I could see several miles of the south shore of the Bay, a land of precipitous black cliffs trending eastward from the Cape which confined Academy Glacier on the east. Westward, north-westward and northward heavy clouds were rolling across the summits of the land from the west. The shore bluffs reached away first north and then north-east, interrupted by the two inlets which I saw in '92, until they vanished in the north-eastern distance.

The face of the Academy Glacier was advanced considerably beyond its position in '92; the surface of the Bay was smooth except for the *sastrugi* caused by the violent winds which undoubtedly rush down from the ice-cap and out of this Bay, as they do out of Whale Sound, and there were but two or three bergs in the Bay away from the immediate face of the glacier. A large tidal crack ran northward from the Cape east of the Academy Glacier.

As to the character of the northern land-ribbon in the vicinity of Independence Bay, paradoxical as it may sound, its appearance, as seen from the heights of the ice-cap, was much less forbidding than that of the Whale Sound ribbon seen under the same circumstances. This I judge to be principally the result of local orographical features, but partly also due to the reversion of the point of view.

The northern shores of Whale Sound are almost continuously bold, and the plateau above the cliffs is almost completely covered either by tongues of the main Inland Ice, as in the peninsula between Bowdoin Bay and Inglefield Gulf, or by detached ice-caps as on Redcliffe Peninsula, Herbert Island, etc., the edges of which in many places are less than a mile from the shore line. As a result the traveller, descending from the heights of the "great ice," sees only the rolling snow-domes of these tongues and isolated caps, with the crests of the black cliffs intersecting them in irregular lines, until he has almost reached the edge of the ice, and is able to look down into the bays and see the warm but contracted slopes along their shores and the little valleys at their heads.

The Independence Bay land on the contrary is, though elevated, rolling and devoid of ice-cap, and broad areas of the red and dark-brown land surface meet the eye.

Another thing in favor of this region is that it is approached from the front, as it were—*i. e.*, from the south—while the other is approached from the back, or the north.

The geological features of the country are practically the same as those of Whale Sound and nearly, if not every, feature of the one region could be duplicated in the other. The lateral moraine of the "great ice" at Independence Bay contains the same rocks and has the same appearance as that at Bowdoin Bay; the level tops of the high mountains and ridges show the same hard, compacted gravel surface (as if formed by a heavy road-roller) that can be seen on the Redcliffe Plateau back of Cape Cleveland; the eastern slopes of Heilprin Land remind me very strongly of the south-eastern shore of McCormick Bay; and the giant cliffs which tower over the Academy Glacier, though much higher, resemble strongly those in Academy Bay.

Dark granite and gneissose cliffs and trap dykes, running in various directions, may be seen here as about Whale Sound.

Wave-marked slabs of red sandstone, identical in color and size of markings to those which I have picked up on the shore of Bowdoin Bay, I saw over 3,000 feet above the sea on the Independence Bay land.

The country east of the Academy Glacier, with the dark cliffs surcharged with a continuous ice-dome, would, but for the absence of exuding glaciers, be strikingly similar to the shore of Whale Sound, between Ittibloo and Netiulumi, while the Independence Bay peninsula proper resembled the country between Inglefield Gulf and Olriks Bay. In fact, the whole country seemed familiar, but with an increased barrenness, savageness and sombreness, as might be expected from four additional degrees of latitude.

Yet again, paradoxical as it may seem, I was struck by the greater abundance of flowing water not only on the land, but along the edge of the ice-cap, in this latitude as compared with Whale Sound.

In 1892 the zone of wastage along the northern edge of the ice-cap was as wide as it was at McCormick Bay, and much wider than it was either season at Bowdoin Bay. And in 1895 the slopes of the "great ice" for several miles in from the moraine at Independence Bay, were free from snow and showed only hard blue ice, while at Bowdoin Bay the deep snow lay even partly over the moraine.

The Academy Glacier, while showing in its upper portion and around the circumference of its great névé basin, features similar to those of the glaciers of Jacobshavn and Tossukatak in Disco Bay, and the Heilprin and Tracy glaciers in Inglefield Gulf, in its lower portion showed peculiar features like those noted by Dr. Coppinger in the Petermann Glacier.

For several miles from the extremity of the glacier the ice-stream is intersected by great vertical-walled canals, in which the water has frozen many feet below the glacier surface. As may be imagined, the discharge of the glacier is controlled by these canals, and instead of fragments of ice and icebergs, as we understand them, great fields of the glacier, miles in extent, are detached and gradually move out into the bay.

The uniformly smooth surface of the bay ice might be accounted for in two ways, either on the assumption that the ice did not break up every year and that the combined effects of partial surface melting in summer, and the drifting snow of spring and fall, would smooth all irregularities; or that it does break up and the moment it is loosened, is driven out to sea by the wind which is always blowing out of the bay. The absence of icebergs in the bay both seasons, except near the end of the glacier, inclines me to the latter idea.

The wide tide crack seen extending northward from the Cape east of Academy Glacier both years; and the mottled appearance of the bay ice in the summer of '92, strengthens this belief.

Small lakes and ponds are numerous over the land and rushing brooks in summer time are everywhere. The presence of nearly continuous sharply marked tumuli and embankments of moraine material, miles in advance of the present edge of the "great ice," indicate more clearly than I have noticed anywhere to the south, the undoubted retreat of the ice from a considerable area of terrene.

The details of our return journey from Independence Bay, like those of the upward journey, have already been given in these pages, and it is not necessary to go over them again. Somewhat recuperated by the liberal rations of musk ox meat, men and dogs fortunately started on the return journey in fairly good condition, and were thus enabled to make the ascent of nearly 8,000 feet to the crest of the "great ice." From this point on, a practically level surface, the absence of storms, the perfection of our equipment, and the use of every expedient known to the Eskimo, or which our own ingenuity could devise, to decrease the friction of our sledges and increase the tractive force of ourselves and dogs, enabled us to travel at speeds from 1½ to 2 miles per hour and to continue these speeds from ten to twelve hours at a time, depending upon the character of the snow. Any sudden or increased exertion, however, would invariably be followed by bleeding at the nose, and a weakness which would compel us to stop and rest. Fortunately for us no ice-cap blizzard occurred during the return march, and we eventually reached the Lodge with all our provisions consumed and one dog out of the forty-one with which we started at the beginning. While this journey cannot be said to have added much to the information gained during the previous trip of '92, it has completed the conquest of the inland ice, and has shown that with the proper supplies and the right kind of men, Greenland can be crossed with safety at any point in a single summer.

Had the discoveries of the first journey across the ice-cap from Whale Sound to Independence Bay been combined with the perseverance and the determination under the most serious handicaps of the second journey, the result would I believe have made the work *facile princeps* among all Arctic journeys.

After we had recovered from the strain of the journey and while waiting for the arrival of the ship, some more work of surveying was accomplished and additional material obtained for the chart of Whale Sound, which accompanies this paper.

This chart is an accurate representation in considerable detail of one of the most interesting of Arctic inlets.

Primary points on it have been determined by astronomical observations, secondary ones by triangulation, and the connecting shore lines run in by an odometer and railroad compass traverse.

Several changes have been made in the contours of shore lines, positions of islands, etc., between Cape York and Cape Alexander, which will be given after my photographic records have been collated.

Material has also been obtained for an interesting chart of the entire region with the native nomenclature.

Other interesting items of work in the Whale Sound region are the determination of the rate of motion of one of the larger glaciers; photographic studies of glaciers, consisting of series of photos of each glacier from the same point covering a period of three years; and the use for the first time, as far as I know, of the barograph and thermograph in Arctic work, by which very interesting sheets of continuous records have been obtained.

The visit of my ship to Jones Sound on the homeward voyage showed discrepancies between charts and actual coast, but the stay of the ship was so short that I have not felt justified in changing existing charts, though the discrepancies are evident to the most superficial eye.

Among other things which I believe my work in North Greenland has established conclusively are; that sledge journeys may be undertaken and carried out by Europeans with safety at any period of the Arctic night; that Europeans can remain in those latitudes for an indefinite time without being troubled by that ancient dread of Arctic explorers—scurvy; that small parties are the only ones suited for effective work in the Arctic regions; that the "great ice" of Greenland is beyond a doubt an unbroken deposit covering the entire interior from north to south and from east to west; and that the mainland mass of Greenland ends between the 82° and 83° parallels, while beyond that is an archipelago of uncertain extent reaching to the northward and north-eastward.

In my various expeditions I have introduced for the first time and determined the feasibility of numbers of novel features of pronounced value to the practical explorer; as, for example, the design for winter quarters; the use of the odometer, the barograph and thermograph, the discarding of the hitherto indispensable sleeping bag.

I believe my methods and equipment especially adapted for Antarctic work as well as Arctic work.

The studies of sledge construction and the designs for clothing have been carried to exhaustive lengths.

Finally I feel that I am justified in considering myself responsible for this last renaissance of Arctic interest, which started by my efforts of five years ago is still increasing in volume and intensity; and for the practical demonstration of the fact that Arctic exploration can be prosecuted upon a very economical basis, and *without loss of life.*

WASHINGTON LETTER.

WASHINGTON, MARCH 26, 1895.

The chief characteristics of what remains of the public domain of the United States are clearly and concisely described by Mr. F. H. Newell in a novel and interesting report entitled "The Public Lands and their Water Supply."* The relative location and area of this domain is shown by a large colored map. The proportion in each State and Territory is illustrated by means of diagrams.

There is still vacant and open to settlement within the boundaries of the United States (not including the Territory of Alaska) an area comprising nearly 630,000,000 acres, or one-third of the total extent of the country. Within this vast extent there is an unknown area—amounting to scores of millions of acres—of forests and wooded lands.

The relative area of the various classes of public lands as compared with the whole land area of the United States is shown by the following table:

	SQUARE MILES.	ACRES.	PER CENT.
Vacant public lands	980,337	627,415,680	33.01
Indian reservations	131,689	84,280,960	4.43
Forest reservations	30,445	19,484,800	1.03
Lands disposed of	1,107,044	708,508,160	37.27
Area of older (19) States	458,195	293,244,800	15.43
Area of Texas	262,290	167,865,600	8.83
	2,970,000	1,900,800,000	100.00

Of the vacant public land, 17,166,080 acres are in the eastern part of the United States, the remainder is in the west, and mainly within the arid regions. The forest reservations are a new institution, having been created by Act of Congress of March 3, 1891.

By far the greater portion of the vacant public lands—over 95 per cent.—are classed as arid or semi-arid in character, and depend for their future value not so much upon altitude, mineral contents, or geological structure, as upon the presence or absence of water. It is a fact now generally recognized that, owing to the scarcity of water, only a small proportion of the now public domain can be reclaimed for agriculture, but this amount, though small when compared with the whole area, is in the aggregate larger than the territorial extent of some of the States, and will sustain a population numbering millions.

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* Extract from the 16th Annual Report of the United States Geological Survey.

Of the public land States,—that is to say, all States excepting the thirteen original, and six States subsequently admitted into the Union within whose limit the Government had no public land,—there are four in which all the vacant land has been disposed of. These are Illinois, Indiana, Iowa, and Ohio. The amount undisposed of in each of the remaining States and Territories varies very widely,—all the way from 1 to 99 per cent. of their respective areas. The public lands lying east of the 97th meridian,—a convenient central vertical line,—are well watered, while the greater part to the west are arid and almost desert-like. Judging from the past rate of disposal in the eastern division, it is safe to assume that within a decade the amount of vacant public land in these States will be insignificant. Over half of the vacant area lies in Arkansas and Minnesota, and in all the States of this division the tracts are, as a rule, widely scattered in relatively small bodies.

In the area west of the 97th meridian the greatest amount of public land is in Montana. The greatest proportion, however, is in Nevada, where, according to estimates, over 95 per cent. of the total area is still at the disposal of Congress. Next in the order of extent of vacant lands is California, with a little more than one-half the total area of the State. The smallest area in any western State is in Kansas—less than 2 per cent. More than three-fifths of the entire area of western public land States consists of open, treeless country.

In the western division the Government Reservations, so-called, occupy 162,134 square miles. The reserves are (1) Indian reservations (82,708,797 acres). These lands are being steadily diminished year by year, being in many cases allotted in severalty to the Indians, and the balance thrown open to settlement by the whites. (2) Forest reservations. This is a novel undertaking here, and somewhat in the nature of an experiment. Since the law providing for them went into effect (March, 1891), seventeen reservations, having an aggregate of 17,564,800 acres, have been set off. They are located in California, Colorado, Oregon, Washington, Wyoming and Arizona. There are none in the eastern part of the United

States owned by the National Government, but the State of New York has instituted a great park or forest reserve in the northern part of its domain. It is not unlikely that many of the older States will adopt this course, not only for supplying timber, but unpolluted water. (3) Military reservations. Of these the total extent is about 1,500,000 acres, lying almost entirely in the western public land States. These military reservations are abandoned from time to time, and eventually form part of the vacant public lands.

In the nature of "reservations," although not by the Government, are the immense tracts granted to railroad corporations, aggregating nearly 50,000,000 acres. These railroad lands extend in broad belts across the country, beginning at the 95th meridian, and include some of the most valuable areas within the States traversed. Through California and Oregon the belt trends north and south.

The main point developed by this report is that the value of the lands of this unoccupied third of the United States is dependent primarily upon the water supply. Much of it has been reclaimed by irrigation, but by far the greater portion cannot be irrigated, and has value mainly for pasturage and for forest growth.

FORESTRY.—The National Academy of Sciences, at the request of the Government, has had under consideration the matter of forest preservation. A commission consisting of notable scientific men has been informally designated to make an investigation of the subject in all its phases. The personnel of the commission is as follows: Charles S. Sargent, Alexander Agassiz, Henry L. Abbott, Prof. William H. Brewer, Arnold Hague and Mr. Gifford Pinchot. In addition to these Prof. Walcott Gibbs, President of the Academy, is an ex-officio member of the commission. All of these gentlemen will be recognized as having qualifications of the very first order for the contemplated investigations.

This is not a national forestry commission, clothed with authority to adopt measures for the preservation of forests on public lands. Its powers are limited to investigation and suggestion. The Academy is required under the terms of its charter to furnish the Executive Departments of the Government or Congress information and advice on questions of practical science when requested to do so. The request for this investigation originated with the Forestry Association during the session of the American Association for the Advancement of Science, last fall. The Secretary of the Interior was selected as the medium of communication with the Academy of Sciences. The Secretary requested an official expression of opinion upon the following points:

1. Is it desirable and practicable to preserve from fire and to maintain permanently as forestry lands those portions of the public domain now bearing wood growth for the supply of timber?

2. How far does the influence of forest upon climatic soil and water conditions make desirable a policy of forest conservation in regions where the public domain is principally situated?

3. What specific legislation should be enacted to remedy the evils now existing?

The names of the men who have been appointed on the Commission are certain guarantees that any report made after personal investigation in the field will command the respectful attention of Congress and of the public. Mr. Sargent is the author of The Sylva of North America, the finest of all works on trees yet published. He is also the author of Reports on the Forest Trees of North America, which formed (with an atlas) one of the monographs of the 10th Census. He is a professor at Harvard and director of the Botanical Garden and Arnold Arboretum. He was also chairman of the Adirondack Forest Commission of 1885. Alexander Agassiz has had extensive experience in California and the West, and was formerly Curator of the Museum of Natural History, Harvard. He is regarded as the first living authority on many subjects of natural history. Henry L. Abbott of the Corps of Engineers, U. S. A., has been connected with the surveys for the Pacific railroads and the Mississippi delta. He invented and developed the system of submarine mines for coast and river defense. His knowledge of the river system of the United States is very remarkable. Prof. Brewer was engaged in the geological survey of California; a professor of chemistry in California, and editor of *Botany.* He is now professor of agriculture at Yale College. Gifford Pinchot has had special training in foreign schools of forestry. He spends most of his time on Mr. Vanderbilt's estate, Biltmore, near Asheville, N. C., experimenting in practical forest economy. Arnold Hague, now of the Geological Survey, has been engaged on the survey of the 40th parallel, and on geological work in California and Utah.

Senator Teller's bill to protect public forest reservations provides that no public forest reservations shall be established except to improve and protect the forest within the reservation or for the purpose of securing favorable conditions of water-flow, and to insure a continuous supply of timber for the people of the States wherein such forests are located; but it is not his purpose to include in forest reservations lands more valuable for mineral or agricultural purposes, and to this end his bill provides that any public lands embraced within the limits of any forest reservation which shall be found better adapted for mining or agricultural purposes than forest uses, may be restored to the public domain, and prospectors and mineral claimants shall have access to such forest reservations for the purpose of prospecting, locating and developing mineral resources.

BOARD OF IRRIGATION.—The latest development of the irrigation inquiry is the "Board of Irrigation, Executive Departments," established by authority of the Secretary of the Interior and Secretary of Agriculture, March 26, 1895. The objects of the Board are the correlation of the several lines of distinct yet related work for irrigation carried on by different departments of the Government, and the discussion and rendering of opinions upon such matters pertaining to irrigation as may be brought before the Board. Its functions are advisory as regards the interpretation and execution of Federal laws concerning irrigation, and also as to coöperation and specialization of work in various bureaus.

The membership of the Board consists of the Director of the Geological Survey, C. D. Walcott; the Chief of the Weather Bureau, Willis L. Moore; the Commissioner of Indian Affairs, Dr. M. Browning; the Ass't Commissioner of the General Land Office, E. A. Bowers; the Chief of the Office of Irrigation Inquiry, C. W. Irish; the Chief of the Hydrographic Division of the Geological Survey, F. H. Newell; the Chief of the Division of Agricultural Soils of the Dep't of Agriculture, Milton Whitney; the Chief Topographer of the Geological Survey, Henry Gannett; the Chief of the Forestry Division, Dep't of Agriculture, B. E. Fernow; the Chief of the Division of Vegetable Physiology and Pathology, Dep't of Agriculture, B. T. Galloway.

Following its line of duty, the Board resolved to prepare brief statements of the following: (1) Existing legislation relative to irrigation; (2) the work hitherto done by the various divisions, whether published or unpublished; (3) the lines and methods proposed to be pursued by each division for the future; (4) the deficiencies and difficulties experienced which might be remedied by coöperative action.

The first three points have been covered by a Preliminary Report, recently printed, which includes also a bibliography of official reports on irrigation, 1879 to 1895. An examination of this bibliography reveals the fact that Government methods in dealing with great economic questions are not always of the first order; for on this subject of irrigation alone one finds at different periods reports from the State, War, Treasury, Interior and Agricultural Departments, Special Agents, Census Office, Senate Special Committees, Commissioner of Indian Affairs, Geological Survey, Bureau of Statistics, Signal Office, Corps of Engineers, and one or two Special Commissions. At the present time the subject is under treatment both in the Interior and Agricultural Departments. The creation of this Board for the purpose of "correlating the several lines of distinct yet related work for irrigation carried on by different deparments" would seem to have been too long delayed.

DEEP WATER-WAYS.—A bill was recently introduced in both the Senate and House, that comprehends a great public benefit and does not demand either a loan or a subsidy. All that is asked is a charter under the name of "Maritime Canal Company" to construct a ship canal not less than 300 feet wide and 26 feet in depth to connect the Great Lakes with the Atlantic. If permission is granted, the Company agrees to complete a canal in ten years, all on American soil, that will make an ample ship route from Chicago to New York City by way of Lakes Michigan, Erie and Ontario, the St. Lawrence River, Lake Champlain and the Hudson River. There are some well-known names among the incorporators.

Simultaneously there is another bill directing the Secretary of War to cause to be made accurate surveys and final estimates of cost of construction of a ship canal by the most practicable route wholly within the United States, from the Great Lakes to the Hudson River, of sufficient capacity to transport the tonnage of the lakes to the sea, and appropriates $50,000 for the purposes of the survey.

There is also pending a bill to incorporate the Lake Erie and Ohio River Ship Canal Company, to facilitate commercial intercourse by water between the Great Lakes and the Ohio and Mississippi rivers. The first name in the list of corporators is that of Andrew Carnegie.

Also a resolution to print for Congressional use an edition of the "Proceedings of the first annual convention of the International Deep Water-ways Association," a volume of 464 pages which traverses the "deep water movement" from the first proposition made one hundred and seventy-five years ago to the present time.

It is proposed to appoint a commission under the direction of the Secretary of War to survey the route for a ship canal from the lower shore of Lake Michigan to the Wabash River, one terminus of which shall be the great harbor of Chicago, and which shall be navigable to the Wabash and the larger rivers flowing to the Gulf of Mexico by the way of the mouth of that river. There have already been two surveys of the main line of this route; one by Col. Stansbury in 1832, the other by Major Gillespie in 1876. Both these surveys fulfilled the requirements of science, but they were made with reference to an ordinary canal, securing a depth of from 4½ to 5 feet of water. The proposed canal route runs through a portion of the country destined to be the most densely settled part of the Union west of the Alleghanies. It will afford the most direct route without breaking bulk from the Lakes to the Gulf. From a military point of view its importance can hardly be over-estimated.

CRIPPLE CREEK DISTRICT, so called, the scene of recent remarkably geographic development, by reason of phenomenal gold production, lies between Beaver and Oil creeks, two tributaries of the Arkansas River. It covers an area of six miles in length by five and a half in width, from seven to twelve miles southwest of Pike's Peak, in the western part of El Paso County, Colorado. It is near the centre of the territory embraced in the Pike's Peak sheet of the Geologic Atlas of the United States. The general elevation of the district is 9,000 to 10,800 feet above sea-level. The creek from which the town and mining district derives its name is one of the numerous branches of Oil Creek which cut deep canyon gorges on the way to the main stream.* The mining camp is reached by waggon roads from Florissant and Divide on the north, from Colorado Springs on the east, and from Canyon on the south. Recently railroads have been built into the district.

That part of the State has been well known to miners and ranchmen for many years. Thousands of prospect pits and trenches dot the slopes of hills on all sides, showing futile efforts at earlier dates to discover the precious metal which has been latent for ages.

The district is essentially a producer of high-grade gold ores. Some of the mines ship no ore averaging less than $100 per ton; a few have a production averaging over $200 per ton, and if rumors are true, very much more. Successful mining was started in 1892. In 1894 the number of mines more or less developed amounted to over 100, and the product to that date was over $7,000,000. The town of Cripple Creek is incorporated, and has telegraphs, electric lights, daily papers, large hotels, etc. Outside of Cripple Creek are numerous smaller settlements and towns, so that the total population of the district is estimated at 15,000.

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* Geology and Mining Industries of Cripple Creek District; by Whitman Cross and R. A. F. Penrose, Jr.

MINERAL RESOURCES OF THE UNITED STATES, 1894.—The form of this volume changes this year from ordinary octavo to the royal octavo. It has been divided into two volumes, and forms Parts 3 and 4 of the always attractive Annual Report of the Geological Survey. Part 3 is devoted to the mineral products which are chiefly sold in metallic form. Part 4 treats of non-metallic minerals and such metallic compounds as find direct use without preliminary reduction to the metallic condition. The treatment of subjects is wide and very generous; by no means confined to productions in the United States, but including geographic discussion of the mineral resources of the world. The charts, diagrams and maps are of special interest.

New York, formerly one of the most important of the iron-producing States, has fallen to the lowest rank of which there is record, viz., tenth. Michigan and Minnesota are now the great producing States, the product of the latter showing the greatest increase.

STATUS OF THE PACIFIC CABLE.—Following the failure in the House of Representatives of the amendment attached by the Senate to the Diplomatic and Consular Appropriation bill in February, 1895, which amendment authorized the President to contract for the entire work of laying a telegraph cable between the United States and the Hawaiian Islands, the President of Hawaii on the 12th of August approved an act which had been passed by the Legislature, "to facilitate the construction and maintenance of telegraphic cables in the Pacific." It was an enabling act, and authorized the President of the Hawaiian Republic to contract with persons, corporations or governments for constructing, maintaining and operating telegraphic cables with the countries bordering on the Pacific Ocean. Closely following on this act a concession was granted to Z. S. Spalding "for laying, working and maintaining submarine telegraph cables from San Francisco to Honolulu and the several Hawaiian Islands," with exclusive right and subsidy for twenty years. It is provided in the concession that the construction of the cable shall begin on or before May 1, 1897, and be completed not later than Nov. 1, 1898. It is stated that Mr. Spalding and his associates are men of probity, enterprise, business ability and of sufficient means. He is well and favorably known in Honolulu, where he has large business interests, in the United States and

England. The amount of subsidy granted, dependent upon the United States joining in this undertaking by granting substantial assistance, is $40,000 per annum.

Following this the Pacific Cable Company was organized under the laws of New Jersey, and is the successor and assign of Mr. Spalding's interest. Among the stockholders are A. S. Hewitt, D. O. Mills, G. M. Dodge, F. D. Grant, Wager Swayne, Z. S. Spalding and others.

Soon after the opening of the present Congress, in December, 1895, Mr. McCormick introduced into the House of Representatives a bill "To provide for telegraphic communication between the United States, the Hawaiian Islands and Japan"; and in January of the present year Senator Hale of Maine introduced a bill "To facilitate the construction and maintenance of telegraphic cables in the Pacific Ocean for the use of the Government in its foreign intercourse." This bill gives the Postmaster-General authority to contract with the Pacific Cable Company for transmission by electrical means between San Francisco and Honolulu of all messages on the business of the United States for twenty years, from July 1, 1897, and the United States is committed to the subvention in round numbers of about $250,000 per annum. The Government reserves the right to take over the ownership of the line at any time before the expiration of twenty years.

Mr. McCormick's bill proposes to give to a company of the same name—Pacific Cable Company,—but organized under the laws of New York, the privilege of constructing and operating telegraph lines from a point or points of the Pacific coast to Pearl River Harbor in the Hawaiian group, and from Pearl River Harbor to such other islands in the Pacific Ocean and Japan as it shall be authorized to connect by lines or cables. The United States agrees to pay during twenty years from the completion of the cable the yearly sum of twenty-five dollars per nautical mile, not to exceed 7,250 miles, or $181,250.

These projects have not yet been acted upon by Congress, and although no immediate outlay of money is contemplated, it is not unlikely that political necessities may demand postponement.

Alaska Boundary.—Mr. Squire in the Senate (January 3) and Mr. Pitney in the House (February 12) made statements concerning the status of this question.

The occasion giving rise to the statements was a resolution reciting that in view of the expediency of forthwith negotiating a convention with Great Britain for marking convenient points upon the 141st meridian of west longitude where it forms the boundary line between Alaska and British North America, and to enable the President to execute the provisions of such convention without delay when concluded, the sum of $75,000 be appropriated to defray the share of the United States in the joint expense of locating the meridian and marking the boundary by an international commission.

The Alaskan boundary is conveniently divisible into two sections. The first, where it follows the contour of the coast from the southern-most point of Prince of Wales Island until it strikes the 141st meridian at or near the summit of Mount St. Elias; the second, where it is formed by the 141st meridian, which it follows from that intersecting point to the frozen ocean. The preliminary survey of the first section by Joint Commission has been going on since 1893, and is now completed, but up to the present date no report of its conclusions has been presented to our Congress. When so presented it can only present data for the information of the respective Governments, upon which when the entire examination shall be completed the two nations may be duly advised, so as to enable them more intelligently to enter into a treaty. It is stated, however, on authority, that the American surveys have demonstrated the fact that there is no range of mountains such as at the time the treaty was concluded between Russia and Great Britain was assumed to exist, and no range of mountains to which the language of the Russian treaty of 1867 can apply. Therefore, the claim on behalf of the United States is and must be that the Territory of Alaska, that is to say, the southeasterly portion of it, shall be bounded to the eastward by a line distant 10 marine leagues from the coast, following the windings of that coast.

The second section is the true location upon the surface of the earth of the 141st meridian, to be ascertained by astronomical survey. The meridian has been located upon the principal water courses which form the highways by means of which miners and other immigrants enter the country,—such as the crossing of Forty Mile Creek, and at the Yukon River. Much time and care is still required to secure the accuracy of observations already made, and to reduce errors to so small a degree that they will be practically immaterial. It should be understood that the Commissions of the two Governments who have been working on this matter have authority only to examine, survey and report. They were not created for the purpose of coming to any agreement so as to bind their Governments. The data collected will afford the basis for a treaty between the United States and Great Britain relative to the southeastern boundary, and it is not unlikely that a convention for this purpose and for marking convenient points upon the 141st meridian is near at hand.

It is proposed that the Coast Survey by proper reconnoissance ascertain whether there is not a southern channel entrance to the Yukon River for sailing vessels, which would obviate the necessity for going as far north as Norton Sound, at which point freight and passengers are now transferred to Yukon River steamers, and also make a thorough survey of the mouth or mouths, if more than one, of said river.

A bill pending in Congress provides for the election of a delegate to that body from Alaska. The Territory now has a population much larger than had twelve Territories (now States) at the census nearest the date of their organization as Territories. The business of Congress as well as of the Departments is increasing to such an extent that an accredited agent or delegate is almost an imperative necessity.

NORTHERN BOUNDARY.—The President is to be requested to enter into negotiations with the Government of Great Britain for the adjustment of the part of our northern boundary between Lake Superior and the Lake of the Woods. There has never yet been a complete survey, location and mapping of this line. The treaty of 1783 defined it only in general and uncertain terms; the treaty of 1794 pledged a joint survey in that quarter; the treaty of 1815 made provision for a commission for the purpose; the treaty of 1842 recited with some particularity the names of several lakes and their connecting waters as forming such boundary. Dispute concerning the ownership of certain islands along the boundary, and the prospective rapid development of the adjacent country, have brought prominently forward the necessity for an accurate survey.

NEW EXPLORATIONS.—One of the bits of exploratory work initiated in Washington last year was that of W J McGee, ethnologist-in-charge of the Bureau of American Ethnology. Leaving Washington toward the end of October, he outfitted at Tucson and proceeded thence through southwestern Arizona and western Sonora to the country of the Seri Indians, comprising Tiburon Island in the Gulf of California, and a considerably larger area on the adjacent mainland. On the island are 500 square miles of territory and on the mainland 2,500 more. The entire tract is mountainous. Tiburon Island embraces half a dozen ranges with peaks of 3,000 to 4,000 feet.

He was accompanied by Mr. Willard D. Johnson, one of the best known and most skilful topographers of the U. S. Geological Survey, who made a plane-table survey of the territory traversed by the party.

The entire region is arid, and portions are uninhabitable desert, and for this and other reasons it has never been surveyed. There is but one feeble stream, and its waters are evaporated before reaching the Gulf. There are some springs, but they are widely separated. The party carried water from seven to fifteen miles to their various camps from these springs. In addition to natural obstacles, the portion of the area known as Seriland has been defended against white invasion by the blood-thirsty inhabitants so effectively that their mountains and valleys have hardly been seen by white men, save from a distance, or from vessels coasting the adjacent waters. The expedition spent about a month in Seriland, making topographical surveys and collecting archæologic and ethnologic data, though the natives, always warlike, were so exceptionally hostile that they kept out of the way of the explorers. They were seen on the borders and photographs of them were occasionally secured, but after the party entered their land the savages kept out of the way. They would abandon their homes and towns as the initial party of explorers approached.

The Seri Indians have been known since the time of Coronado as savage warriors, using poisoned arrows, and they are generally thought to be cannibals. This, however, Mr. McGee doubts, but he is certain of their desire to kill all men except their own. They have a few guns, and occasionally a man with a hat is seen, but these are the ones nearest the border. During the historic period, their number has diminished through constant warfare from about 2,000 to 350 or less, mostly women and children. They are entirely without agriculture, and live largely on sea-food, commonly eaten raw; they navigate the adjacent waters in reed canoes, use the bow and arrow effectively, and wear short skirts, sometimes supplemented by robes or blankets, both made of pelican skins. They are of large stature, and are remarkable for strength, speed and endurance. In physical characteristics, language, arts, and habits of life, they appear to be distinct, constituting a separate stock or family. They are the most irreconcilable to civilization of any savages on the American continent. From historical records it is known that the Seri have been engaged in practically continuous warfare against all peoples for two or three centuries, and their archæology and some of their characteristics and customs indicate that they have been inimical to neighboring tribes for many centuries.* They are greatly dreaded by the Mexicans as well as by the other native tribes, and will undoubtedly become extinct at an early day.

The 14th Annual Report of the Bureau of Ethnology, which is now in the printer's hands, will comprise two parts instead of one, as hitherto. The first part will consist almost wholly of a memoir on "The Menomini Indians," by Dr. W. J. Hoffman. This tribe was found by Nicolet in 1634, but has thus far received no scientific attention. The work will embrace an exposition of ceremonials of initiation into the Cult society, generally designated as the Grand Medicine society, and will be a completion of the same work rendered with reference to the Ojibwa Indians, which was for the first time made public by the same writer in the 7th Annual Report. The present memoir will embrace also the mythology, social customs, totemic organization, arts and manufactures, and will conclude with a comprehensive vocabulary, with critical notes on Menomini geographic terms.

The second part of this report will contain an account of Coronado's journey to Cibola and the Great Plains in 1540–1542, with all the Spanish documents, and English translations, notes, and a bibliography, by George Parker Winship. Also, The Ghost Dance, by James Mooney.

The 13th Annual Report, which is nearly off the press, contains the following interesting papers: (1) Prehistoric Textile Fabrics of Eastern United States; by W. H. Holmes. (2) Stone Art; by Gerard Fowke. (3) Aboriginal Remains in Verde Valley, Arizona; by Cosmos Mindeleff. (4) Omaha Dwellings, Furniture, and Implements; by J. Owen Dorsey. (5) Casa Grande Ruins; by Cosmos Mindeleff. (6) Zuñi Creation Myths; by F. H. Cushing.

Mr. F. W. Hodge, of the same Bureau, is preparing for publication an index of the six quarto volumes of Schoolcraft's great work on the Indian Tribes of the United States. It will contain approximately 25,000 references.

GEOGRAPHIC NAMES.—The United States Board on Geographic Names announces decisions from October, 1895, to March, 1896.

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* *American Anthropologist,* March, 1896.

There are 262 in all. The following corrections, alterations, or changes occur in New York:

Bemis Heights, Saratoga County.—Not Bemus Heights.

Blodget; hill in Coeymans, Albany County.

Brunswick Center, Rensselaer County.—Not Center Brunswick.

Chuctanuda (North and South); two creeks in Montgomery County.

Crandell Corners, Washington County.—Not Crandall's Corners.

Cropseyville, Rensselaer County.—Not Cropserville.

Feurabush, Albany County.

Feuri Spruyt, Albany County.—Not Spraigt Kill.

Gardiners Island, east of Long Island.—Not Gardner.

Glenmont, Albany County.—Not The Abbey.

Halfmoon, Saratoga County.—Not Half Moon.

Haynersville, Rensselaer County.—Not Haynerville.

Lauson, Albany County.—Not Lawton.

Putts; creek in Essex County.—Not Putnams.

Quackenkill, Rensselaer County.

Slingerlands, Albany County.—Not Slingerland.

Tackawasick; creek in Rensselaer County.—Not Ts-ats-awassa, nor Cummings.

Vloman; kill (or creek), Albany County.—Not Vlamans Kil, nor Vlauman Kill.

The Board decides that the name of the Argentine Republic in South America is Argentina.

OCEAN TRAVEL.—General J. A. Dumont, the Supervising Inspector-General of Steam Vessels, recently made the following interesting statement for the information and possible relief of mind of timid persons who fear to make an ocean voyage, or if they do so, and while on board a steamer, are in constant trepidation, to the discomfort of themselves and their associates on such a voyage. He said:

"A comparative statement of the dangers by land and sea, as shown by official records on the subject, shows that as a rule life is safer to-day on an ocean steamer than when travelling by railroad or any other vehicular mode of travel; in fact, safer than is pedestrian travel in large cities, or while engaged in the ordinary employments of life on land. For instance, in the twenty years ending June 30, 1895, there were reported 100 ocean and coastwise steamers lost. Total number of lives lost, 776, or an average loss per annum of less than 39 persons, while on the railroads of the United States during the five years ended June 30, 1894, there were killed, as reported at the Interstate Commerce Commission, 34,304 persons, including passengers and employees, or an annual average of 6,861 persons killed.

There are no statistics in this country, that I am aware of, from which data can be obtained as to the number of people killed in general employments, but I am informed that Germany keeps a record of all accidental loss of life among workmen, and I have seen an apparently authentic statement in a newspaper lately that the German records show a loss of life from accidental causes of 39,000 workmen from October 1, 1885, to December 31, 1893, a period of eight years and three months, or an annual average of 4,727 such persons, which annual average is over six times the number of persons, passengers, and employees lost on ocean steam vessels in twenty years.

While the above statements show that there is no absolute preventive against accidental loss of life, either on land or water, they also show that the United States, by its beneficent laws and faithful execution thereof by its duly appointed officers, has reduced the losses of life on steam vessels to a minimum not reached by any other maritime nation."

MARINE CONFERENCE.—It is proposed to convene the delegates of the United States to the late International Marine Conference to reconsider the revised international rules to prevent collisions at sea. In 1894 an understanding was reached by the principal maritime Powers that these rules should go into effect March 1, 1895. This understanding was broken by a change of position of the British Government, which in January, 1895, notified the United States that until Parliament had been consulted it could not agree to the date fixed. Several other nations also withdrew their assent, and by act of Congress the date was postponed. It is expected that the final views of the British Government will be received soon. The object of the reconvention is to consider whatever amendments may be proposed and report its conclusions to Congress for final action.

AERIAL NAVIGATION.—It is proposed to award $100,000 from the Treasury of the United States to any person who shall prior to the year 1901 construct an apparatus that will demonstrate the practicability of safely navigating the air, at a speed of not less than 30 miles an hour, and capable of carrying passengers and freight weighing at least 400 pounds. Also $25,000 for an apparatus that will demonstrate the practicability of safely navigating the air in free flight toward any desired point of the compass for a distance of one mile or more in a descending line; the point of alighting to be not more than 65 feet lower than the point of starting. No use to be made of any gas lighter than air.

HISTORICAL.—Senator McMillan has a bill before Congress appropriating $25,000 for the preparation and publication of the Revolutionary Archives in the Department of State. Senator Daniel has another, appropriating $20,000 for the purchase of the papers and correspondence of Jefferson, now in the possession of his great-grand-daughter. Senator Chandler, still another appropriating $10,000 for the unpublished correspondence and manuscripts of Monroe known as the Gouverneur collection. Numerous petitions have been circulated asking for the publication entire and complete of the Journals of the Continental Congress.

INDIANOLA TERRITORY.—Congress is considering the advisability of creating a territorial form of government, by the name of the Territory of Indianola, for the Five Civilized Tribes now occupying the Indian Territory; the right of suffrage to be accorded to all male citizens and Indians over the age of twenty-one years who are actual residents of the Territory.

NOTES.—The Venezuelan Commission recently received the report of Justin Winsor, who was intrusted with the difficult task of going over 300 maps of the Venezuela-Guiana territory. These maps came from all available sources, including the collection of the State Department, Congressional Library, etc. Mr. Winsor has been tracing back these various maps to establish the basis and authority for them. This has resulted in eliminating a great part of them, as they were reprints. The conclusions of Mr. Winsor are regarded as important in the development of the case.

The representatives of various governments which make decennial enumerations of the people are making efforts to secure uniformity in the inquiries to be used in future censuses. It is proposed in Congress that the Commissioner now in charge of the United States Census correspond with the census officers of other countries for the purpose of securing such uniformity, and also report a plan for a permanent census service.

A Washington branch of the American Institute of Archæology was recently organized. The objects of the society are, in the main, those of the general society, whose headquarters are at Boston, to wit, the prosecution of archæological research in this country and abroad, and the formation at Rome of an American Society similar to that now in operation at Athens. Secretary, Dr. A. P. Montague, of Columbian University.

In the interest of good roads Representative C. W. Stone pro poses (by bill) to create a special commission on highways to consider the expediency of, and best methods of, providing for the scientific location of highways on the public domain; the employment of the Geological Survey in the discovery of road materials; the free testing of all road materials offered; the construction of model roads and instructions in road-making. The National League of Good Roads, and the League of American Wheelmen, both strong organizations, are strenuously and vigorously advocating the measure.

The Directory of the Scientific Societies of Washington (8th publication) shows a total membership of 1,851 for seven societies; an increase of 1,046 in eight years. These figures represent resident, active and life members only, honorary and non-resident members aggregating 455 more.

A bill before Congress proposes to annex a portion of Arizona to the State of Utah; that is to say, that portion of Arizona lying north of the middle of the channel of the Colorado River and west of the eastern boundary of Utah. H.

RECORD OF GEOGRAPHICAL PROGRESS.

AMERICA.

LABRADOR.—It is expected that quite a large party of college students and naturalists will sail from New York City about June 16 for St. John's, N. F., whence they will embark upon another vessel for the northern Labrador coast, the purpose being to spend six weeks or so studying the zoölogy, geology, botany, archæology and anthropology of that region. It is one of the college excursions to interesting fields of study that, of late years, have been so successful. The expedition is organizing at the University of Pennsylvania, but a number of other institutions will take part in it. The field work will be directed by a number of specialists in these branches of science, and the purpose is to collect material and make as thorough a study as the limited time permits of the northern part of the Labrador coast. The party will be divided into four or five sections, each in charge of one or more professors, and the vessel will leave the sections at the mouths of inlets or rivers, up which they will travel, studying the plant and animal life. These inland trips will be made in boats and with adequate camp outfit. Dr. Frank Russell, archæologist, and curator of the University of Iowa, will give special attention to the study of the Labrador Eskimos, who have many curious traditions, legends and customs, and he hopes to make collections of their folk-lore and handiwork. In order to increase the fund for this enterprise, accommodations for a few laymen will be provided. The professors will give lectures daily on their various subjects, illustrated by the specimens procured, and thus the excursion will be made a valuable training school for young naturalists. The party will return to New York about Sept. 12. Mr. C. E. Hite, of Philadelphia, who has supplied this information, writes to us that the expedition of 1894 (*vide* Bulletin A. G. S., Vol. XXVII., No. 1, p. 63), of which he was a member, found the country full of life and presenting many unique features of much interest to naturalists. He adds: "So far as known, the species of animals and plants number: Invertebrate marine life, 337; insects and spiders, 113; fishes, 23, notably trout, salmon and cod in abundance; batrachia, 3; birds, 209, notably ducks, ptarmigan and other game birds; mammalia, 44, among which are herds of cariboo and reindeer, black bear and five species of seal, easily obtained and affording rare sport. The plants number 296 species, and the number will be much increased by further research. These shores have been visited by not more than half a dozen naturalists, and at long intervals apart. No systematic study has yet been made of the peninsula, geographically or otherwise, and so the field is comparatively virgin." Dr. A. S. Packard, in his book "The Labrador Coast," 1891, says that the Moravian missionaries have given us a much better idea of the intricacies of the extreme northern coast than the charts of the British Admiralty or the United States Coast and Geodetic Survey.

Discovery in Canada.—The most recent Canadian explorations of importance are in the region south of Hudson Bay, which Dr. G. M. Dawson designated, in 1890, as "the unexplored region in Canada lying nearest to large centres of population." Between Hudson Bay and the water-parting between its drainage system and that of the St. Lawrence, is an area of 50,000 square miles (as large as New York State) which, up to two years ago, was very little known. In the eastern half of this region Dr. R. Bell, of the Canadian Geological Survey, visited, last summer, a river basin of considerable extent, whose timber and mineral resources give it prospective value. Current reports of the importance of this river system are undoubtedly exaggerated, and the official information is not yet at hand. Mr. Henry O'Sullivan, Inspector of Surveys for the Province of Quebec, made an important journey in the latter part of 1894 in the district just north of the headwaters of the Ottawa River, and west of Dr. Bell's field of labor on the west. An account of this journey appears in the "Report of the Commissioner of Crown Lands for the Province of Quebec," for the year ending June 30, 1895. He found the height of land separating the Ottawa basin from the Mekiskan basin, on the Hudson Bay slope, only three miles north of the northern end of Grand Lac Victoria, whose position he had determined in 1893 as 47° 48′ 25″ N. Lat., 77° 20′ 05″ W. Long. This point was 960 feet above the sea; the height of land is only 40 feet higher, and a portage only 600 feet in length separates the waters of the two basins. North of the water-parting he at once observed a striking difference in the character of the soil and timber. Lake Waswanipi, in 49° 40′ N. Lat. was the northern limit of his journey. The country he crossed, sloping very gently towards Hudson Bay, he describes as fertile land, well adapted for agriculture, with an abundance of merchantable timber, principally tamarack, which, on account of its enduring qualities in contact with the soil, is highly prized for fence posts and railway ties. In the Upper Ottawa valley the prevailing surface rocks are gneiss and granite, with a sandy soil, while north of the water-parting sedimentary rocks are the characteristic geological formations, and the soil, particularly in the lower levels, is fertile, but in the higher tracts there is considerable rough and scrubby country of little promise. Mr. O'Sullivan describes Lake Waswanipi as a fine sheet of water, 680 feet above sea level, "surrounded by a splendid looking country, level or gently rising in easy slopes, of the richest soil all around, timbered with large spruce, fir, tamarack, bouleau, poplar, etc." The most northern part of this lake is a little south of the latitude of Winnipeg, and Mr. O'Sullivan believes that the climate of the country he traversed compares favorably with that of Manitoba. At Lake Waswanipi, on September 20, he saw potato tops as green as in midsummer. He thinks several thousand square miles are well adapted for agriculture, and throughout his journey he found abundance of water, rivers and lakes, and numerous cascades that would supply motive power. He adds that it would be comparatively easy to build a railroad from any part of the province of Quebec into the heart of this region.

BIFURCATIONS IN SOUTH AMERICAN RIVERS.—Mr. Georg Hübner, who has been travelling for two years in the basins of the Orinoco and the Amazon, reports that the Casiquiare River which unites these two great river basins by a natural water channel is, by no means, the only instance of important river bifurcations in that region. The *Geographische Zeitschrift* (February, 1896) says that Mr. Hübner has found in Venezuela, and particularly in the territory of the Casiquiare, a number of these unions between rivers, and he believes that they will have an important influence upon trade in the future, as they will greatly facilitate communication by water. He adds that a gradually increasing portion of the waters of the Orinoco is reaching the Rio Negro and the Amazon through the Casiquiare, on account of the widening of the gap on the left bank of the Orinoco, which forms the connection between the two rivers. When M. Chaffanjon examined the bifurcation of the Casiquiare in 1888 he said that the place of junction of the two rivers was about 150 feet wide. He accounted for the bifurcation, which he thought had not existed for a long period of time, in this way: A short distance above the Casiquiare the Orinoco flows through a gorge only ninety yards wide. This contraction of the river bed greatly accelerates the current and just below the gorge the rapid stream gradually undermined the left bank, cutting a channel toward the head-waters of the Casiquiare, of the Amazon system. The water parting there is quite near the Orinoco. Finally, in some period of flood, a little of the Orinoco's overflow reached the Casiquiare, and the excavation of a channel was thus begun, the channel being deepened in subsequent rainy seasons, until the union between the two rivers was complete.

PHYSIOGRAPHIC MATERIALS.—At the third annual exhibit of the New York Academy of Sciences, on March 26, there was, for the first time, a showing of physiographic materials. The exhibit was a small one, and was under the charge of Richard E. Dodge, of the Teachers' College. It included a collection of recent text and scientific books and a set of maps and models illustrating certain chosen topics from the principles of physiography. The aim was to show the best sources to obtain the details of the science as well as the material that could be readily used to illustrate the principles, both to children and to those of more mature years.

The models exhibited were of two classes. One series was to illustrate a theoretical cycle of land development upon constructional forms of various origins. In this case no one place was taken as a type locality. A definite set of conditions was assumed and the changes in form consequent upon the conditions were illustrated. Each land type was shown in its youthful, mature and senile condition. The second set of models was of actual localities in this country, modelled with a small vertical exaggeration, and illustrated particular cases in which examples of rivers, drainage, form, etc., could be found that corresponded with the theoretical cases shown in the first class.

The first set of models was loaned by the maker, Prof. W. M. Davis, of Harvard, who uses them in his teaching. The second set was also loaned by the maker, Mr. E. E. Howell, of Washington, D. C.

The remainder of the exhibit consisted of selected maps showing the relation of topographic form and geologic structure, to illustrate means of representation of form and the importance of a knowledge of physiography in studying the features and conditions of a land. New Jersey was the special base best illustrated. The other maps shown were to illustrate types of shore lines from along the Atlantic and Gulf coast. These maps were the sailing charts of the Coast Survey, and gave examples of the various practical uses that could be made of these maps by the student of land forms and their development.

It was not intended to show all that had been done in the last year in this branch of science, which is advancing so rapidly. It was rather intended to offer suggestive materials that would serve to illustrate, in a striking way, the range of possible studies in the science and the paths along which investigation and application of principles are advancing.

Inasmuch as a proper understanding of physiographic principles and processes is the best basis for the study of political geography and history, it was intended to show in this small way some of the lines of dependence of man, in his development, upon the physiographic features. Another year it is hoped to make the exhibit more inclusive and to show the direct application of principles to other branches of learning.

EUROPE.

Erosion on the Coasts of England.—The sea continues to make disastrous inroads along the Eastern and Southern coasts of England, and particularly along the chalk cliffs of Kent, where the English Channel narrows. Correspondents of the London *Standard* take the extremely gloomy view that unless something is done to stop the waste, the entire County of Kent and large parts of the South and East coasts will disappear entirely from the map of England. The sea, driven by tides and winds, dashes against the lower part of the cliffs, softens the porous rock, and digs into it deeper and deeper until the mass above, deprived of its support, breaks off, falls over on the narrow beach, and is washed away by the currents. Engineers seem to have little faith in sea-walls or embankments for protection, they being regarded as only temporary, no matter how costly they are. The efficacy of a wide beach of shingle or sand is affirmed, and the correspondents protest against the practice of removing shingle, stones and even large boulders, which are taken away in boats or schooners and sold, thus robbing the shore of a source of natural protection.

ASIA.

Distribution of Armenians in Asiatic Turkey and Transcaucasia.—*Petermanns Mitteilungen* for January, 1896, contains an article on the distribution and number of Armenians in the larger part of their native home, comprised in Asiatic Turkey and Transcaucasia (Russian), illustrated by a map compiled by Dr. Supan. The facts given show that the Armenians form a far smaller element in the population of the recently disturbed districts than has been generally supposed. Nearly two-thirds of the Armenians living in Asiatic Turkey are found in Armenia and Kurdistan, and in the five Vilayets comprising these territories the percentage of the total population which they contribute is: Erzerum, 20.2 per cent.; Van, 18.6; Diarbekir, 16.8; Bitlis, 33; Mamuret-el-Aziz, 12.1. The total Armenian population of these five Vilayets is 478,701, which is not quite one-fourth of the total population, the Mohammedans being nearly three times as numerous, while Jews, Greeks and other Christians contribute a small element. The statistics deal also with the Vilayets of Sivas, Trebizond, Adana and Angora in Asia Minor and Aleppo in Syria, and including them in the general calculation, it appears that in the ten Vilayets of Asiatic Turkey where the Armenians are in any considerable numbers they form only about one-sixth of the population, the Mohammedans being twenty-five times as numerous, while the Nestorians and other Christians are about one-tenth of the population. In Transcaucasia, however, the Armenians who live there in peace and security, while their kindred south and southwest of them are now plunged in the deepest misery, form 36.3 per cent. of the population.

MR. MUMMERY'S DEATH IN THE HIMALAYAS.—Mr. A. F. Mummery, famous as an Alpine climber, lost his life in August last in the Himalayas while attempting to reach the summit of Nanga Parbat (26,630 feet), whose northern flank is washed by the Indus about ten miles away from the central mountain mass. His two Gurkha companions perished with him. He had reached a height of about 20,000 feet on the south side of the mountain. The climbing was most severe, and the last 5,000 feet required two days and a night. Then the Gurkha with him was taken ill and he was compelled to retreat to his camp, 11,000 feet below. Later he tried the northern side of the mountain, he and two Gurkhas ascending a long glacier pass that seemed to offer a promising route. He was last seen on August 24 going up a side glacier tributary to the main ice stream on which he had started. The subsequent search made it evident that all three had been buried under a snow avalanche. The pass where they disappeared from view was a narrow valley walled in by steep slopes covered with snow and ice. As Mr. W. M. Conway showed, in the story of his climbing in the Himalayas, avalanches are the greatest danger that explorers meet among these mountains.

Sources of the Irawadi.—Prince Henry of Orleans, one of the new Gold Medallists of the Paris Geographical Society, completed at Sadiya on the Brahmaputra River, on last Christmas, probably the most noteworthy journey of exploration in 1895. He started from Ha-noi, capital of Tonkin, on January 26, last year, accompanied by Lieutenant Roux, M. Breffaut, a Tonkin colonist, and twenty-seven baggage animals, his purpose being first to attain Tali-fu in Yunnan, avoiding main routes and the paths of explorers and giving particular attention to the upper Mekong River in its course through Western China. He found the basin of the Mekong in China, above 24° 40′ N. lat., to be so narrow that it may be crossed in a few hours. From Tali-fu he took the shortest route to India, across a mountainous country that is not practicable for trade. It led him through the region of the Upper Mekong, Salwin and Irawadi rivers, in about 28° N. lat., hitherto supposed to be inaccessible on account of hostile natives, though the Prince, with his two white comrades and his baggage-men, had no trouble. This good fortune enabled him, he says, to finally settle the long-vexed question of the source of the Irawadi. An extract from his letter to the Paris Geographical Society, printed in the London *Times* on February 7, says: "The three branches forming the Irawadi, are, reckoning from the west, the Kiu-Kiang, the Telo and the Namkiu. The first two are the deepest and widest. They are not marked on the maps. The most northerly branch, the Kiu-Kiang, does not rise higher north than 28° 30′ N. lat." He crossed all three branches. He also affirms the inaccuracy of the late Gen. J. T. Walker's map of South Eastern Tibet (Proceedings of the Royal Geographical Society, June, 1887,) and of his map of Tibet, published by the Royal Geographical Society in 1894, in which the Salwin River is indicated as rising near Tchamonlong, south of 28° N. lat. The Prince says he has evidence that the Ur Chu (also Nag Chu or Lu), rising far north and west near Tengri Nor in inner Tibet is the upper course of the Salwin. Only a small part of the course of the Ur Chu has yet been surveyed, but it has, for some years, been indicated in a number of the best atlases as the probable upper course of the Salwin. The mountains among which the Mekong and the Irawadi rise and through which the Salwin and the Brahmaputra flow have long kept the secret of more hydrographic problems than were found in any other small part of the earth. The barbarous Mishmi and other tribes barred the way to explorers Wilcox (1826), Griffith (1836), Abbé Krick (1851–53), and the travels of Pandit Krishna, Macgregor, Needham and others gave food for geographical controversy if they did not settle vexed questions. It is now known that the Sangpo of Tibet is the upper course of the Brahmaputra and not of the Irawadi, as Mr. Robert Gordon, supported by old Chinese geographers, ingeniously contended (*Proceedings* of the Royal Geographical Society, May, 1885), and that the Ur Chu or Lu of Tibet is the Salwin and not the Irawadi.

NEW ATTEMPTS TO REACH LHASA.—*Petermanns Mitteilungen*, No. 8, 1895, says that Dr. P. Moewis has assumed the habit of a Lama at Darjiling and has professed his conversion to Buddhism as preliminary to an advance upon Lhasa, which he hopes by this means to reach. Mr. and Mrs. St. George Littledale have returned to England after spending a year in a vain attempt to reach Lhasa. They penetrated to within forty or fifty miles of the holy city. Starting from Constantinople in November, 1894, they reached Samarkand by the Trans-Caspian Railway and then followed the usual caravan route to Osh, Kashgar and Khotan, buying transport animals by the way. When they set out from Khotan they had 250 transport beasts to carry their food and fodder and the large collections they had already made. A large number of their horses died for lack of food while crossing the desert to Cherchend and Tibet, and the party, numbering thirteen in all, were compelled to abandon their zoölogical collections, books, instruments and, in fact, everything that was not necessary for life. After reaching Tibet the greatest pains were taken to escape observation, the intention being, if possible, to get to Lhasa without being seen by the people. They made long detours to avoid shepherds or nomads whom they saw in the distance, and often they marched at night and camped during the day. Mr. Littledale says, in an interview published in the London *Times:*

> "In spite of the hardships we had to endure, all went well until the beginning of July, when we were within 200 miles of Lhasa. Suddenly we rode into a Tibetan encampment in a narrow pass. We saw the Tibetan shepherds and their flocks in the valley long before we came upon them; but, as a detour was impossible, there was nothing for it but to go through them. Presently two officials came out and told us to stop, which we refused to do, and rode through the encampment as hard as possible. We were not attacked, but we knew that messengers had been despatched to warn the people of our approach, so we rode as hard as we could in order to keep ahead of them. After a week's hard riding we reached Tengri Nor, and here 200 horsemen, armed with spears and matchlocks, were assembled. One man came up and seized my bridle, but, on my pulling out my revolver, he let go. Shortly after this the force disappeared, and presently occupied both sides of a narrow valley through which we had to pass. The situation was threatening, but we had no fighting. With loaded weapons we rode through the Tibetans, pushed on over a very

high pass and finally got to within forty or fifty miles of Lhasa. There we were met by an army of 500 men and some Lamas, who told us to go back. We refused, and stayed for a month arguing with the people. Almost every day the Dalai Lama—the spiritual ruler of Tibet—sent us a message telling us to go back. At this time Mrs. Littledale fell very ill, and we had to make terms for retiring. The people wanted us to go back the way we came, but this was, of course, out of the question. We told them that we would fight our way through in the direction of Sikkim. Seeing we were in earnest, the Tibetans finally allowed us to go via Ladak, which place we reached in November last."

AFRICA.

THE LAKE REGION NEAR TIMBUKTU.—Since the French forces took possession of Timbuktu several members of the military staff have added some interesting facts to our knowledge of the surrounding region. A map published in the *Comptes Rendus* of the Paris Geographical Society (1894, Nos. 18, 19), compiled by Lieutenant Bluzet, gave the first definite information about the lacustrine region that had been discovered west of the Niger and south-west of Timbuktu. The same publication (1895, p. 62), added some details regarding the vast unexplored region in the desert, north and north-east of Timbuktu and east of Dr. Lenz's route. He found no water between Arauan in the desert, and Timbuktu, but a little east there are wells at In Alahi and Bu Jebiba. The latter is a clay-built town and this route is preferable to that followed by Lenz. A summary of the results of the French researches in the region around Timbuktu is presented in the *Bulletin* of the same society, (1895, part 3) by Lieutenant Bluzet, illustrated by a map on a scale of 1:500,000 (approximately thirty-two statute miles to an inch). The paper and map give some idea of this new-found lake region, still partly unexplored, which lies south and east of Lenz's route. Debo, the most southern of these lakes, into which the Niger pours in two channels, is described as a fine deep lake whose blue waters wash a clean sandy beach on the east. North of this lake the whole country on both sides of the river is inundated for half the year and when the waters subside they leave behind, in depressions of considerable depth, a series of lakes connected with the river by channels nearly choked with vegetation. The basins of these lakes, which extend north to the desert, are separated by water-partings of a mean elevation of about 330 feet. Ten of these lakes are known to exist, but they have not all been visited and there may be others. The largest and most northern of them is Faguibine, which is sixty-eight miles long and attains a depth of more than 100 feet. Mountains bound it on the north and east.

Storms are frequent and violent and numerous islands in the lake are very convenient places of refuge when the waves threaten to engulf small craft. Lake Tele is connected with Faguibine on the south by a narrow channel and the Gundam Channel connects Tele with the Niger, flowing to the river in the dry season and from it in the period of inundation; "we must admire," says Lieutenant Bluzet, "the discretion and skill of the guides who escorted Dr. Lenz within a few hundred metres of the lake [Faguibine] without letting him see it; and neither Barth nor anyone else heard of it."

THE POLAR REGIONS.

DR. NANSEN AND THE NORTH POLE.—The fullest statement with regard to the origin of the report from Siberia, in February last, to the effect that Dr. Nansen had discovered the North Pole and was on his way home, was telegraphed from Irkutsk to St. Petersburg, on March 3, by the governor of Irkutsk, who reported that he had received the following from Yakutsk on the lower Lena River:

"Peter Ivanovitch Kuchnareff, who trades at Ustyansk [near the Arctic coast, and the trading point on the mainland which is nearest to the New Siberian Islands] by a letter dated November 10, communicated the following to the merchant Kuchnareff at Yakutsk:—'We learn that Dr. Nansen's expedition has reached the North Pole, has discovered a hitherto unknown land, and has now returned. Consequently the Arctic Ocean has now been explored.' No confirmation of the above has been received from other sources. In order to verify the news and, in case of necessity, to render assistance to the expedition, the governor of Yakutsk has instructed a member of the administration in the Verkhoyansk District to proceed to Ustyansk."

No report has come that Nansen or any of his men had been seen, and while there was some tendency in Europe to give credence to the earliest version of this story, the fact that no confirmation has since been received, and that the story was discredited by the leading Russian authorities, including the Governor-General of Eastern Siberia and the Secretary of the Russian Geographical Society, have practically destroyed all faith in its possible accuracy. From the first all American geographers were entirely skeptical.

THE SO-CALLED JEANNETTE RELICS.—In a letter to the New York *Sun*, printed on February 22, Dr. W. H. Dall gives reasons for believing that the loose papers, biscuit boxes, oil-skin trousers and other articles picked up on an ice floe near to the coast of southwest Greenland in the summer of 1884, were not, as had been affirmed, relics of the Jeannette party which had drifted across the Polar area from north of the New Siberian Islands, but had been set afloat by the crew of one of the Greely relief vessels of that year, in the belief that another ship of the fleet might pick them up and be mystified by the find. The fact that Dr. Dall and other American authorities believe they have ample evidence to wholly discredit the so-called relics should be recorded, inasmuch as geographical periodicals generally have accepted them, for years, as genuine, and are still republishing the story in connection with the rumors about Dr. Nansen. Dr. Dall says that he stated the facts in letters to Dr. Rink and Baron Nordenskiöld and he adds:

"Shortly before Dr. Nansen's expedition started, some friend of his, whose name has escaped me, wrote to me on Nansen's behalf in regard to these relics, and the facts as I understood them, were furnished, so that, before he sailed, though after he had written of the relics as genuine, Nansen was informed of their doubtful or fraudulent character, at least if my letter to his friend was passed on to him. No doubt of the perfect good faith of the Danes or of Nansen can be held for a moment, but that the latter may have retained his faith in the Arctic currents of which he (as I believe mistakenly) wrote, is altogether probable."

Prof. George Davidson, President of the Geographical Society of the Pacific, writes that the Society has appointed Sir Henry Lund and himself a Committee to report upon the Jeannette relics. Sir Henry represented the Society at Copenhagen two or three years ago and there learned by personal conference the story of the relics. There was then no doubt of their genuineness and the Society means to urge the investigation.

EKROLL'S WINTER IN SPITZBERGEN.—Some years ago, Martin Ekroll announced his desire, as soon as he could secure funds for the purpose, to use some point in Spitzbergen as a base for a sledge journey over the ice-covered sea, to the North Pole. He spent the winter of 1894–95 in Spitzbergen for the particular purpose of studying the ice conditions, and he has returned to Norway convinced that the chances of reaching the Pole by sledge from Spitzbergen are exceedingly remote. In the summer of 1894, the waters along the eastern shores of the archipelago, usually choked with ice, were quite open, so that Ekroll's vessel was able to reach the east coast of North East Land, where he wintered, the vessel being frozen in the ice from October 17, 1894, to July of last year.

Many bears were seen and sixty-three were killed. Mr. Ekroll believes that the formation of glaciers, especially in East Spitzbergen, is on the decline.

MR. ANDREE'S COMING BALLOON EXPEDITION.—Mr. Andree, who will attempt to cross the North Polar area in a balloon, expects to complete the airship in April, to start, early in May, for the northwest coast of Spitzbergen, and to be all ready there, if a favorable wind occurs, to begin his venturesome journey by May 25. The cloth of which his balloon is making is said to combine lightness with a greater degree of strength of texture than has been attained in balloon-making, heretofore, and the seams are still stronger than the cloth. A balloon house is building in Norway to be taken in sections to Spitzbergen and there erected. This octagonal house will be about 80 feet high and 110 feet broad. It will be covered by a roof of balloon cloth, and in this structure, the balloon will be inflated and confined until the ascent is made. The floor and inside walls of the house will be covered with felt to prevent damage to the balloon by friction. Thirty-five tons of sulphuric acid and malleable iron shavings will be taken to Spitzbergen for the manufacture of the inflating gas. Letters have been despatched to all the Hudson Bay posts in Northern Canada, to spread intelligence of the enterprise among the Indians and Eskimos so that they may not regard the balloon as a dangerous apparition, but may be disposed to give the explorer assistance if necessary. The same information is being spread over Northern Siberia. Mr. Andree succeeded in arousing so much interest in his project in Scandinavia that ample funds were provided for his needs. While Arctic authorities by no means approve of his scheme, they will await its outcome with much interest. Mr. Andree is a very accomplished aeronaut and he deserves success, even though so perilous a mission cannot be encouraged as a practical method of extending geographical knowledge. At all events he has won respect by his careful and cautious preparations, availing himself, as he has done, of every aid that science affords. He has a record of nearly every cache of provisions that has been left in Arctic regions which may, possibly, be of use to him if he is stranded in those parts. His balloon will carry two or three persons, a sledge, sailing boat, several guns, a camera, ballast and provisions for four months. Mr. Andree believes it will be sufficiently gas tight to hover in the air for thirty days at a height of about 800 feet. At starting he desires a south or nearly south wind in order to get into the central Polar basin over a considerable part of which, if he has good fortune, he may drift, driven by variable winds. Dr. Ekholm the well-known meteorologist, who had charge of the Swedish station in Spitzbergen in 1882–83, will accompany him.

The Geographical Society of the Pacific, in compliance with a request made by the Minister of Sweden and Norway at Washington, early in March appointed President Davidson and Sir Henry Lund, the Swedish Consul at San Francisco, a Committee to take measures for spreading through Alaska and the coasts and islands of the Arctic the information which shall prepare the inhabitants to receive and to aid the explorer Andree, in the event of his descending among them during the summer from his daring balloon voyage to the Pole. A number of notices for distribution among the natives of Northern Alaska, British Columbia and Siberia, were sent by the steam whaler *Orca*, which left San Francisco for the Arctic on the 17th of March.

The Alaska Commercial Company, the Pacific Steam Whaling Company and other organizations have responded favorably to the appeal made in the following letter:

GEOGRAPHICAL SOCIETY OF THE PACIFIC.

SAN FRANCISCO, March 16, 1896.

Captain Josiah N. Knowles, President of the Pacific Steam Whaling Company—Dear Sir: The Geographical Society of the Pacific has been officially informed that Professor Andree will complete the outfit of his balloon expedition to the North Pole so as to start from Spitzbergen in the month of July. This attempt to reach the North Pole is favorably supported by the Swedish Government and by scientific men in Europe who have investigated his appliances and methods.

Of course no one can predict where this balloon may come down in the circumpolar regions, and the Swedish Government is desirous that information shall be sent to that region whenever it is practicable by all such parties as are in or going to the North. Therefore the Geographical Society of the Pacific proposes to exert its influence in urging all parties from California, Oregon, Washington and British Columbia to make known to the inhabitants of those parts of Alaska, British Columbia and Siberia bordering upon the Arctic Ocean, the possibility of the balloon reaching their country and asking them to give the balloonists support and assistance and help and direct them to the nearest white settlements, and if the balloon should be seen from any place, that the natives will report the same to the nearest white settlement.

The Geographical Society of the Pacific therefore urges the Pacific Steam Whaling Company to instruct their captains to circulate this information about the balloon to all natives and persons within their reach in the Arctic regions.

By order of the Council,

GEORGE DAVIDSON,
HENRY LUND,
Committee.

THE GERMAN SOUTH POLAR EXPEDITION.—The German Commission for South Polar Exploration issued a memorial in December, outlining its scheme for a German Expedition. The Commission advises that the proposed expedition shall enter the Antarctic regions from the Indian Ocean along the meridian of Kerguelen Island, which is between the widely separated routes of Cook (1773) and Nares (1874), offering a wholly untried route into the unknown area and which, on that account, may result in interesting discoveries. To carry out the desired investigations in meteorology, terrestrial magnetism, geodesy and other branches of science, it is important to spend a Winter upon an island or upon the coast of the supposed Antarctic continent. It is desirable that two vessels shall be at the disposition of the party, one to remain at the headquarters of the expedition for whatever service the explorers there may require, while the other ship engages in geographical and hydrographical investigations. These vessels should be specially built for Polar navigation, and of about 400 tons burden (nearly three times the tonnage of the Germania of the German North Polar Expedition of 1869–70). Each ship should carry thirty men, including on each vessel four officers and four scientific specialists, from among whom the observers at the station should be selected. The total cost of the expedition is provisionally estimated at $225,000, a considerable part of which has already been pledged by private citizens who are interested in Antarctic exploration. Subscriptions towards completing the fund are invited. The financial participation by the government in the enterprise will depend upon the interest shown by the amount of public subscriptions. The President of the German Commission is Professor Dr. Neumayer of Hamburg, the well-known meteorologist and, for years past, one of the foremost advocates of the great importance to science of the renewal of Antarctic research.

NO AMERICAN ANTARCTIC EXPEDITION YET.—The report has been widely printed in Europe and copied into some American journals that an expedition consisting of two vessels, left this country last fall, to engage in exploration in the South Polar area. The report is entirely incorrect, as no American expedition has sailed for Antarctic waters; nor are we aware that there is any immediate prospect of the launching of such an enterprise here.

THE OCEANS.

THE DEEPEST SOUNDINGS YET MADE.—It was announced in the *Bulletin* (No. 4, 1895), that Commander A. F. Balfour on H. M. S.

Penguin had discovered a deeper spot in the ocean than any yet known. His observation, however, was not complete, as his wire broke when he had run out 4,900 fathoms without having reached bottom. This was in the Pacific Ocean, in 23° 40′ S. Lat., 175° 10′ W. Long., over 200 miles south of the Island of Tongatabu, the largest island of the Tonga or Friendly group, and in the neighborhood of the usual steamship route between San Francisco and Australia. Later, he resumed his sounding with much success, as is described in *Nature* of February 27, obtaining three casts that are deeper than any previously made. Returning from Tongatabu to the spot where he had failed to reach bottom with 4,900 fathoms of wire, he found it at 4,940 fathoms, and a little northeast of this spot he reached bottom at 5,022 fathoms. A little further east he found the bottom shallowing, and obtained a sounding at 3,100 fathoms. Then turning southwest over a bank where his wire measured depths between 2,200 and 4,400 fathoms, he struck another great depression of 5,147 fathoms, about 100 miles E. N. E. of Sunday Island, in the Kermadec group, and 100 miles east of MacCarthy Island he secured the deepest sounding yet made, 5,155 fathoms, which is 600 fathoms or 3,000 feet deeper than the sounding by the U. S. S. *Tuscarora* near Japan in 1874. It is interesting to observe that these three soundings of over 5,000 fathoms were not obtained in the same hollow, but are separated by areas of much less depth. The two extreme soundings were 450 miles apart. On two occasions the usual abysmal red clay was brought up by the sounding tube and a microscopic examination of the specimen from 5,147 fathoms shows that the remains of siliceous organisms are almost, if not entirely absent. The discovery of these greatest known ocean depths near the sub-marine plateaus on which rest the island groups of Tonga and Kermadec, gives further confirmation of the fact already observed, that "as a rule, the deepest water is found not in the central parts of the great oceans, but near or approximately near the land, whether of continental mass or island isolation."

A REMARKABLE VOLCANIC ISLAND.—The *Geographical Journal* for January, 1896, prints an account by Lieut. Boyle T. Somerville, H. M. S. *Penguin*, of a visit to the small island of Niuafóu, which is quite isolated in the Pacific, about midway between the Fiji and Samoa groups. This island is the upper portion of a volcano reared from the sea floor by the accumulation of ejecta, and the remarkable feature about it is that an eruption blew out the interior, leaving merely a ring around a central cavity. This ring, which is about 3½ by 3 miles in diameter, has an average height of 350 feet above the sea, and is covered with vegetation, except in one place, where a recent lava stream has not yet received its coating of green. The ring is nowhere more than a mile in width, and parts of it are much narrower. The whole of the interior area, about 3 square miles, is occupied by a picturesque, nearly circular lake, roughly 2 miles in diameter, containing three green islands. Round its circumference drops a sheer precipice, 200 to 300 feet in depth, whose sides are covered with the luxuriant foliage and huge creepers of the tropics, from which, here and there, buttresses of rock jut out that, ages ago, must have overlooked the huge crater basin of fire beneath, now covered by the peaceful lake. Lieut. Somerville and his party descended to the lake whose surface was found, by aneroid, to be 95 feet above the sea level. The water is slightly alkaline, but the horses on the island drink it. The lake is called "Vai Lahi" (Great Water), contains no fish and is said to be very deep, though the tradition of a sounding of 100 fathoms with no bottom requires confirmation. Moti Moli Moli, the second in size of the three islands, is said to have a small crater of its own containing fresh water, a lake within a lake. An oddly shaped peninsula with a bare, reddish surface jutting into the lake from its east side, was lifted above the water in 1886, by an eruption, and clouds of dust and sand were being driven by the wind into the lake. This mass was upheaved from the lake bottom. The natives have begun to plant cocoanuts on the lower parts of it. Besides an abundance of wild ducks, there is another bird which is said to be found alone on Niuafóu. It is called "Malau," and apparently belongs to the family of Megapodes (birds with large feet, of which the jungle bird of Australia is a typical example). It buries its eggs for hatching in the soft, hot sand. It is the size of an ordinary fowl, russet-brown in color, shaped like a guinea fowl, with small head and strong, pink legs and feet. About 1,000 Tongans live in nine villages on the sea edge of this narrow crater rim. They are all Christians. One French priest, two English traders and a German form the white population. The disintegrated lava makes a deep rich soil, and cocoanuts, bananas, taro and other tropical food plants are raised in abundance. Copra is exported. The island is the northern limit of the Tongan dominions, and has a native Tongan governor. The anchorage is poor, but a landing may be made without much difficulty when the tide and wind are favorable.

THE INTERNAL SLAVE-TRADE IN AFRICA.

It is well known that the internal slave-trade is the most potent of the evil influences which oppose the progress of civilisation in Africa.

It was so recognised in the GENERAL ACT BETWEEN THE UNITED STATES OF AMERICA AND THE OTHER POWERS FOR THE REPRESSION OF THE AFRICAN SLAVE-TRADE, AND THE RESTRICTION OF THE IMPORTATION INTO, AND SALE IN, A CERTAIN DEFINED ZONE OF THE AFRICAN CONTINENT, OF FIRE-ARMS, AMMUNITION AND SPIRITUOUS LIQUORS.

This Act was ratified in the United States, January 19, 1892, and took effect on the 2d of April, 1892. It declares that the best means to extinguish the slave-trade and slavery itself are:

(1) The organization of a civilized administration by Christian nations.

(2) The establishment of a net-work of fortified stations and centres of civilization.

(3) The development of lines of communication by roads, especially railroads, by steam navigation on lakes and rivers, and by telegraphic wires.

(4) The organization of an armed police force, to intercept slave-caravans and ensure the safety of the roads and waterways.

(5) The exclusion of rum and fire-arms from certain regions.

(6) The encouragement of scientific exploration, of legitimate commerce, and of Christian missions without distinction of creed.

It provides for the establishment of bureaus in Europe and in Africa to watch over the execution of its clauses, for the granting of letters of freedom by competent authorities, for the repatriation or the settlement and education of liberated slaves.

Recognizing that mere liberation seldom improves the condition of the slave, it calls for the assistance of special societies organized for the purpose of liberating, settling and educating the victims of the slave-trade.

With this Act before him as a text, Mr. Heli Chatelain, who has devoted himself for years most unselfishly to the work of civilisation in Africa, shows in a recent pamphlet what has been done for the extinction of slavery by Germany, England and the Congo State, and by the anti-slavery societies, Catholic as well as Protestant, and how much also remains to be done.

Mr. Chatelain, as an American, now calls on the people of the United States to do their part in this great task of redemption. In his twelve years of unpaid service in the cause he has made himself thoroughly acquainted with the native mind and character, out of which, under instruction and guidance, must come the development of Africa.

The following plan of operation, which he has elaborated, has received the approval of many distinguished men, as inexpensive, simple and practical:

Plan of Work: (1) Obtain from England, Germany, France, Portugal or the Kongo State suitable concessions of land and the promise of liberated slaves—if possible, with a subsidy.

(2) Settle these ex-slaves on alternate lots, with the needful tools, seeds, clothing and food to enable them to raise a first crop.

(3) Teach them by example how to improve native house-building, farming and industries; introduce civilized trades and new cultures of saleable produce.

(4) Induce the settlers to work, by purchasing this saleable produce and giving them in exchange useful articles of trade; encouraging them also in thrift.

(5) Sell them the empty lots as fast as they have earned enough to pay for them, and procure them legal titles to their farms as soon as they realize the importance and responsibilities of proprietorship.

(6) Teach them reading, writing, arithmetic, geography, and give practical instruction in non-sectarian Christian religion, as well as in civilized citizenship.

(7) Submit each colony to a code of rules designed to exclude the main causes of the African's miseries and of the ruler's difficulties, which causes are: (*a*) Witch-doctoring (practical poisoning), legal ordeals (from which thousands die year after year), and all heathen practices; (*b*) polygamy, with all its evil concomitants (cause of endless misery); (*c*) rum and hemp-smoking (two baneful, brutalizing agencies); (*d*) idleness (largely due to slavery); (*e*) immoral white men.

Staff of Workers.—(1) A superintendent (if possible a medical man); (2) a farmer and mechanic; (3) a teacher (one or two of these married); (4) native Christians or colored Americans as assistants.

Probable Cost.—Foundation and first year of one settlement for about 200 men and women $10,000; second year $2,000; within a few years final self-support.

It is hoped that each settlement will become self-propagating, the income from the sale of empty lots enabling the Society to start another colony.

Any person or company giving $5,000 would have the naming of a settlement and a voice in its management.

Organization (special features).—NAME: "Philafrican Liberators' League." MEMBERSHIP: Every person contributing $1 annually. LOCAL BRANCHES: to be established in principal cities. OFFICERS: (1) An Executive Committee, composed of prominent men and women, who take a practical interest in the League and are able to meet at stated times; (2) A General Council composed of delegates of Local Branches; (3) An International Council, composed of great names connected with African work; its functions being honorary and advisory; (4) And, of course, the usual staff of presidents, secretaries, trustees, etc.

General Policy.—The Philafrican League will simply take the slaves whom the governments have liberated, and transform them, in cordial understanding with said governments, into hard-working, civilized, law-abiding Christian citizens of the countries in which they reside.

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BOOK NOTICES.

Elementary Physical Geography. By Ralph S. Tarr, B.S., F.G.S.A., Assistant Professor of Dynamic Geology and Physical Geography at Cornell University, Author of "Economic Geology of the United States." Macmillan & Co., New York and London. 1895. Price $2.50.

In preparing this book, Mr. Tarr has made an attempt to meet the apparent demand for a new text-book on physical geography without following what he calls the somewhat radical suggestions, which were made by the majority of the Geography Conference of the Committee of Ten,* though he does not neglect the physiographic side of his subject. The sole purpose has been to present facts and furnish information without discussing methods, and the author has little faith in the value of text-book work without the aid of the laboratory and field study.

The three parts into which the book is divided treat, respectively, of the air, the ocean and the land. The earth as a planet, the solar system and the nebular hypothesis find a place in the first division with the atmosphere, its circulation and disturbances, weather and climate and the geographic distribution of animals and plants; a range wide enough to satisfy the most exacting physiographer. Logically, a description of nature may fairly include everything that is, but the nebular hypothesis might, perhaps, be taken for granted in this case.

The orderly presentation of topics and the care taken to insure scientific accuracy are deserving of praise; but it must not be supposed that the book is a repository of dry facts. It is, on the contrary, full of vitality and freshness for the reader as well as for the student, and every one interested in the new physical geography, which has absorbed and transformed the old, will make haste to possess the volume. The style is generally direct and clear, though marred at times by an incorrect word or phrase, such as *proven* and *we now know considerable.*

Mr. Tarr makes great use of illustrations, all well chosen, but not always successfully rendered.

See *Reports of a Conference on Geography*, Journal of Am. Geog. Soc., Vol. XXVII, 1895, pp. 30–41.

Conquest of the Country northwest of the River Ohio, 1778–1783, and Life of Gen. George Rogers Clark. Over one hundred and twenty-five Illustrations. With numerous Sketches of men who served under Clark and full list of those allotted lands in Clark's Grant for service in the Campaigns against the British posts, showing exact land allotted each. By William Hayden English, President Indiana Historical Society. 2 vols. 8vo. Indianapolis, Ind., and Kansas City, Mo., The Bowen-Merrill Company, 1896.

These solid volumes contain a part of the material collected by Mr. English for a contemplated history of Indiana, to which they might have served as an introduction, had death spared the author to work out his plan.

The story of the Conquest is told at great length and with frequent digressions, all interesting in themselves, but out of place in the narrative which they interrupt. The author seems to have been embarrassed by the number of documents in his hands, as well as by the difficulty of keeping in view at the same time the biography of Clark and the events of the Conquest. There is no perspective in the composition and the attention is fatigued with unnecessary details. This is the more to be regretted that Clark was a remarkable man and that a well-written life of him would be a valuable contribution.

In the Appendix to the first volume Mr. English has printed Clark's Letter to George Mason (first published in 1869 by Robert Clarke & Co., Cincinnati) and Clark's Memoir, now first given to the public in full. The Memoir is without date, but Jefferson, in a letter written in 1791, speaks of Clark as then probably engaged in "writing the account of his expeditions north of Ohio."

Other papers are: A List of the Officers and Soldiers of the Illinois Regiment and the Land allotted to each; Sketches of the Men who served under Clark; Account of Clark's Brothers and Sisters; and a List of the Officers and Privates who served in the Campaigns but did not receive allotments of Land in Clark's Grant.

The work is abundantly illustrated with portraits, fac-similes, plans and diagrams, and with some not very happy sketches of historical scenes.

Names and Their Histories. Alphabetically arranged as a Handbook of Historical Geography and Topographical Nomenclature. By Isaac Taylor, M.A., Litt. D., Hon. LL.D., Canon of York. Author of 'Words and Places.' 8vo. New York, Macmillan & Co., 1896.

Canon Taylor says very truly, in the *Prologue* to this book, that speculation as to the meaning of a name, without reference to its primitive form or to its subsequent history, is always futile, and frequently misleading, but this sound proposition has not always been kept in view. Learned as he is, Canon Taylor makes some rash statements, and in one instance, at least, he betrays a great simplicity of mind. He rightly condemns in his *Prologue* many of the American names, such as Memphis, Utica, Troy, Minneapolis, Indianapolis, and adds:

> Worst of all is the procedure adopted in the new State of Washington, where the counties were named by shaking the letters of the Alphabet in a bag, and then emptying them, a few at a time, upon the floor, a process which has yielded such hideous monstrosities as Wankikum, Klickitat and Snohomish (p. 24).

State Legislatures are guilty of many things, but the counties of Washington were named years ago, before the Territory was admitted as a State, and the names Wahkiakum, Klickitat, Snohomish, Kittitas, Kitsap, Skagit and other unlovely combinations are genuine Indian names, racy of the soil. A Psalmanazar might invent them, but not a legislature, and a good mathematician might calculate how many years would be required to produce the single word, Wahkiakum, by the bag-shaking process.

Under *Sierra Leone* is the following explanation:

> The word *Sierra* (Portuguese *Serra*) is often supposed to denote a toothed or saw-like range of mountains, but is probably a corruption of the Arabic *sahra*, which we have in the name SAHARA (*q. v.*).

This name Canon Taylor translates by *deserts* or *wildernesses*, and looks no further for the meaning of *sierra*, which is none the less the Latin word *serra*, and has nothing to do with Arabic. The testimony of Du Cange is decisive on this point:

> Thereafter SERRA began to be used for mountain or hill: in which sense the Spaniards even now say *Sierras** . . . . .

The article on Trinidad is pre-eminent for inaccuracy and recklessness:

> . . . the look-out at the masthead saw three separate flat summits, which were afterwards found to be united, so as to form one island. Hence Columbus called it *Ilha de la Trinidad.* In like manner a triangular island on the western coast of India was regarded by the Portuguese as a symbol of the Trinity, and hence called *Divo,* now DIU.

Columbus says: subió un marinero á la gavia, y vido al Poniente tres montañas juntas: (*Navarrete, Viages y Descubrimientos, Tom. 1, p. 247.*)

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* Exinde SERRA, pro Monte, vel colle usurpari coepit: qua notione Hispani etiamnum *Sierras* dicunt . . . .

(*Glossarium Med. et Inf. Latinitatis, Tom. VI, p. 205.* Firmin Didot edition, 1840–1850.)

a sailor went up to the main-top, and saw to the west three mountains joined together.

The island was named *Isla de la Trinidad*, because Columbus used the Spanish language. If he had meant to use Portuguese, he would have written *Ilha da Trindade.*

Diu, the "triangular island on the western coast of India," is not triangular, but oblong (six and a quarter miles in length and one in breadth), and it was not regarded by the Portuguese as a symbol of the Trinity. If it had been so regarded and if they had wished to name it in consequence, they could not have called it *Divo*, because that is not a Portuguese word and it does not mean the Trinity. It is an Italian word, signifying *divine.* Canon Taylor is apparently under the impression that *Divo* is the Portuguese name of *God*, but his learning is at fault, and those who follow his guidance will go astray. In the Portuguese language the name of *God* is *Deos*, or, more correctly, *Deus*, as in Latin. The name *Diu* is not of European origin; it is native to India. According to Yule and Burnell (*Glossary of Anglo-Indian words, p. 246*) it is derived from the Sanskrit *dvipa*—island.

The examples given show Canon Taylor at his worst. Much of his work is well done and will be helpful if used with discrimination; but he is unfamiliar with Spanish and Portuguese, both needed for his task, and his knowledge of Italian is slight. He writes Talavera *della Reyna*, *Don* Quadra (art. *Vancouver*), Rio *das* Amazonas (as Spanish), Rio Janeiro (p. 17), Riviera *de* Levante (p. 27), Piazza *di* Termini (art. *Termini*), and the like. He spells the name of a well-known Russian city, Vladika*u*kaz, not regarding the value of the Russian *B*.

Some of these errors may be due to the printer, but for most of them the responsibility lies with the author.

In the following passage, from his Preface, Canon Taylor assumes a position and invites a comparison:

> I have also omitted many recent names in the Arctic regions and in Australia, ... as they will mostly be found in Egli's *Nomina Geographica*, a valuable though not always trustworthy work. Useful as this compilation has proved, I have, in most cases, thought it best to refer directly to the books he quotes, and to which his work serves as a sort of Index (p. v.).

Dr. Egli's work is marked by judgment and sound scholarship, not less than by wide reading and original investigation. It may be called a compilation, in the sense in which Grimm's dictionary is a compilation; but to say that it is not trustworthy is to use words without knowledge. Dr. Egli is scrupulously faithful in his citations and interpretations, and it may be affirmed that the most patient search through the 1035 pages of the *Nomina Geographica* will fail to bring to light any error, implying ignorance or presumption on the part of the author. Not even Canon Taylor can say as much for the 390 pages of *Names and Their Histories.*

The Hill-Caves of Yucatan. A Search for Evidence of Man's Antiquity in the Caverns of Central America. Being an Account of the Corwith Expedition of the Department of Archæology and Palæontology of the University of Pennsylvania. By Henry C. Mercer, Curator of the Museum of American and Prehistoric Archæology at the University of Pennsylvania, in charge of the Expedition. With Seventy-Four Illustrations. 8vo. Philadelphia, J. B. Lippincott Company, 1896.

Mr. Mercer's thoughts had been occupied since the year 1890 with the idea of searching in the caves of Yucatan or Chiapas for the beds of charcoal and ashes associated with human relics and denoting human occupancy, when, at the end of 1894, Mr. J. W. Corwith, of Chicago, made an offer to the University of Pennsylvania to equip an expedition. Even then, with Yucatan in his mind, Mr. Mercer seems to have been undecided which way to turn; whether to Brazil, or to Peru or to Mexico. Prof. Heilprin came to the rescue with a report of large, dry caves in a small range of hills in Central Yucatan. In these there were signs of human habitation and they might be expected to furnish an answer to the question: How long had man lived in Yucatan?

The hills in question are in the western part of the peninsula, southwest and south of Merida, and they are overgrown with forest. The caves open into the ground like wells. They form, says Mr. Mercer,

> a very striking class of underground chambers from fifty to three hundred and fifty feet in diameter and from fifteen to seventy feet high, more or less brightly lit by round openings in the ceiling ten, twenty and fifty feet in diameter. Through these skylights fragments of the original crust had fallen, forming piles of loose stones on the cave floor. When the downfallen accumulations set sufficiently against one side of the orifice, it was easy to walk down their slope, but, as a general rule, a chasm of some feet had to be bridged over in reaching them, either by descending on a rope or clambering down the root of the alamo-tree, which flourished on the brink of most of the skylights, often sending its tendrils to the cave floor. Where the rock pile was high enough, banana-trees and tropical evergreens growing upon it swept the brink of the chasm with their boughs, making strange rattlings when the wind blew. Some-

times the subterranean groves lay far beneath the surface in rotundas inaccessible from above. Then they were first seen after a long clamber underground, like gardens beneath the vaultings of sombre passages. Doves built their nests in high ledges by the skylights, and animals found refuge under the rock heaps, where Indians had built blinds of loose stones to stalk them (*p. 22*).

The work of the expedition occupied sixty days and the area examined was about one hundred miles in length by ten in breadth. Twenty-nine caves were visited and ten of these were excavated. Thirteen had archæological significance. Six yielded valuable, and three, Sabaka, Oxkintok and Loltun, decisive results. The layer of human refuse was substantially the same in all the caves, which had not been used as dwellings nor as burial-places, but only as halting-spots.

Human bones in the rubbish indicated that cannibalism had been practised. The explorers found neither copper nor gold nor silver, no jade, no gums, no preserved grains, no cloth, no weaving apparatus, no pipe, no tobacco, and they agreed upon these conclusions:

First. That no earlier inhabitant had preceded the builders of the ruined cities of Yucatan.

Second. That the people revealed in the caves had reached the country in geologically recent times.

Third. That these people, substantially the ancestors of the Maya Indians, had not developed their culture in Yucatan, but had brought it with them from somewhere else.

It is recognized that these conclusions may be upset by future revelations in some cave or caves not visited by this party, but meanwhile they stand as the outcome of a most intelligent and carefully-conducted exploration.

Mr. Mercer did not confine his observations to caves and human rubbish. His remarks on the country and the scenery, the living Mayas and their ways, have more than a passing value.

Some misprints, such as *siebo-trees* and *terra caliente*, several times repeated, should not have been allowed to pass.

The text is elucidated by more than seventy illustrations from photographs and drawings.

Lakes of North America. A Reading Lesson for Students of Geography and Geology. By Israel C. Russell, Professor of Geology, University of Michigan. 8vo. Boston, U. S. A., and London. Published by Ginn & Company, 1895.

In this volume Prof. Russell has brought together the results of his studies and observations during thirteen years' geological work for the National Government, supplemented by information drawn from the publications of the U. S. Geological Survey and several State surveys.

The history of a lake, he says in his Preface, begins with the origin of its basin, and considers among other subjects the movements of its waters, the changes it produces in the topography of its shores, its relations to climate, its geological functions, its connection with plant and animal life, etc.

There are no natural groups of lake basins, so defined that they may be easily classified, but the mode of origin supplies a good working principle of classification, and this has been adopted by the author. He describes briefly and well the depressions on new land areas, the basins due to atmospheric, aqueous, glacial and volcanic agencies, the basins formed by earthquakes, those resulting from movements in the earth's crust, from land-slides and chemical action. All these types are represented in North America. Among the mountain lakes Prof. Russell is uncertain whether to give the palm to Tahoe, or to the comparatively unknown Lake Chelan in Washington. This is a narrow, river-like sheet of water, extending westward from the Columbia River seventy-five miles into the mountains, and bordered on either hand by a continuous series of rugged peaks, that rise from five to over seven thousand feet above its surface. The valley in which the lake lies, seldom more than four miles wide, is not less than one hundred miles in length. The narrow valley bottom is filled with majestic trees and a lower vegetation of almost tropical density, and from the head of the lake the loftiest summits of the range, usually white with snow, can be seen far up the gorge beyond where boats can go.

The climate of the region is mild, almost throughout the year, and the lake is now accessible by railroad.

In his remarks on the Laurentian lakes, Prof. Russell says:

> Lake Superior still retains its position as the largest sheet of fresh water known, although the more recent discovery of Lake Victoria Nyanza has brought a rival into the field. This African lake is estimated to have an area of about 18,000, which is 12,000 square miles less than the great American lake; but when an actual survey shall have been made, it is possible that this difference will be materially decreased (p. 57).

It does not appear who estimated the area of the Victoria Nyanza at 18,000 square miles.

Whoever he may have been, he certainly did not take into account what is actually known of the lake. It extends through nearly three degrees of latitude and quite three degrees of longitude, and its outline, except in the southeast, is fairly regular.

Its area is estimated in *Longman's Gazetteer* (1895) at 32,167 square miles; in Vivien de Saint-Martin's *Nouveau Dictionnaire de Géographie Universelle* (1894), at 83,310 square kilometres=32,167 square miles. It is yet too early to decide whether it is larger or smaller than Lake Superior, but there is every reason to believe that its area greatly exceeds that of Lake Huron.

If Prof. Russell accepts an insufficient estimate for the Victoria Nyanza, he is clearly wrong when he affirms (p. 69) that the maximum depth of the Caspian, 3,000 feet, exceeds that of any other lake known. The Polish savants, Dybofski and Godliefski, who took careful soundings in Lake Baikal in 1876, found a maximum depth of 1,373 metres=4,504 feet.

Good illustrations and diagrams add to the value of this compendious work.

ACCESSIONS TO THE LIBRARY.

JANUARY–MARCH, 1896.

BY PURCHASE.

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Illustrated Travels: a Record of Discovery, Geography and Adventure, edited by H. W. Bates, London, s. a., 6 vols. 4to.

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Vol. 18, 1896, No. 1, Jan.–Feb.

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Año II, 1895, Nos. 132–150; Año III, 1896, Nos. 151–194.

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Mittheilungen, Band XI and XII.

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Archiv, Neue Folge, 27 Band, 1 Heft.

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Nord-Amerika, seine Städte und Naturwunder, u. s. w., Leipzig, 1892, 4to; Nord-Amerika, i våra Dagar, Stockholm (1893), 4to; Tausend und ein Tag im Occident, Leipzig, 1891, 2 vols. 8vo; Korea: Eine Sommerreise nach dem Lande der Morgenruhe, Dresden und Leipzig, 1895, 4to; Kanada und Neu-Fundland, Freiburg-im Breisgau, 1888, 8vo; Andalusien, eine Winterreise durch Süd-spanien, u. s. w., Leipzig, 1894, 8vo; Chicago, eine Weltstadt im amerikanischen Westen, Stuttgart, Berlin, Leipzig, 1893, 8vo; Chicago, Världsstaden i den Amerikanska Västern, Stockholm (1893), 8vo; Prairie-Fahrten, Leipzig, 1878, 8vo; Die Einheitszeit nach Stundenzonen, Leipzig, 1892, 8vo; Curiosa aus der neuen Welt, Leipzig, 1893, 8vo; Mexico, Land und Leute, Wien und Olmütz, 1890, 8vo.

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Bulletin 109, Jan. 1896. Agricultural Experiment Station. Geological History of the Chautauqua Grape Belt, by R. S. Tarr.

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Mitteilungen, Band 14, 1895.

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The Fourth Annual Report of the Council for Year ending December 31st, 1895.

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Catalogue, 1895–96.

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Annual Report for 1894, with Map, Valley of the Passaic, by Rollin D. Salisbury.

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Journal, Vol. 18, 1896, Jan., Mar.

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Third Report to the Board of Managers, by O. F. Cook. 1896.

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Report of the America's Cup Committee, Defender-Valkyrie, 1894–95; Report of Regatta Committee, Season 1895; Report of Special Committee on certain Charges made by the Earl of Dunraven, 1896.

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Laboratory Bulletin, No. 3, Bird Migration at Grinnell, Iowa, and Oberlin, Ohio. By Lynds Jones, Assistant in the Museum; Library Bulletin, Vol. 1, No. 3; The History of Church Music, etc., by Edward Dickinson; Annual Report of the Librarian of Oberlin College for the Year ending Aug. 31, 1895.

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Le Canal de Suez, Bulletin Décadaire, 1895, Dec. 22, 1896, Jan. 2–Mars 12.

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Le Tour du Monde, 1895, Livraison 52; 1896, Livraisons 1–12.

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Carte du Congo Français (2 sheets), avec Notice et Index Alphabétique.

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Bulletin, Tome XVII, 1895, Fasc. 12; Tome XVIII, 1896, Fasc. 1, 2.

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Comptes Rendus, 1895, Nos. 14, 15 et 16; 1896, Nos. 1 et 2.

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Spelunca. Bulletin, 1ère Année, 1895, Nos. 1, 2, 3.

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Bulletin, 19e Année, 1895, Nos. 4, 5, 6, Avr.-Mai-Juin; 7, 8, 9, Juil.-Août-Sept.

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Journal, Vol. 141, Nos. 1–4, Jan.–April, 1896.

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Bollettino, 1895, Nos. 68–70; 1896, Nos. 71–74.

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Bulletin (17^e Année), 1895, Mars–Avr., Mai–Juin, Juil.–Août.

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Mitteilungen, 1896, Heft 1.

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Bulletin, XI, 1894.

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Bulletin, Vol. II, 1895, No. 5; Vol. III, No. 1.

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La Cornoide. San Salvador, 1895, 8vo.

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Bulletin, Vol. 1, No. 6, May, 1895; No. 7, Jan. 1896.

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Diario Oficial, Año XVI, Trim. 1, Núms. 1–61; Informe sobre el Camino a Matina y la Costa del Norte, por D. Enrique Cooper; Compendio de las Publicaciones Referentes al proyecto de D. Isidro Levkowicz sobre fundación de la Soc. Mercantil Costarricense y Estatutos de la Misma.

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Anuario Hidrográfico de la Marina de Chile, Ano 18, 1895; Bibliografía Maritima Chilena (1840–1894) por Nicolas Anrique R.

From the Securities Co., Philadelphia:

New York Securities. A Descriptive and Statistical Manual of the Corporations of New York City and Brooklyn, etc. New York, 1893, 8vo.

From M. T. Singleton, Author:

Gravitation and Cosmological Law. Atlanta, Ga., 1895, pamphlet, 8vo.

From the Bureau de Statistique de la Principauté de Bulgarie, Sophia, Bulgaria:

Mouvement Commercial de la Bulgarie avec les Pays Etrangers, etc., pendant Septembre, Octobre, Novembre, 1895.

From Lehigh University, South Bethlehem, Penn.:

The Educational Value of Engineering Studies. An Address delivered on Founder's Day, Oct. 10, 1895, by Thomas Messinger Drown, Pres.; School of Mechanical Engineering. Under Direction of Prof. J. F. Klein.

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49 Statistical Documents.

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Records, Vol. IV, Part IV, 1895.

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Proceedings, 2nd Series, Vol. X, Part 2, May and June, 1895.

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Annual Report, 1894–95.

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14 Année–1895–Nos. 3 et 4, 5 et 6.

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Mittheilungen, Vol. 39, 1896, No. 1.

From the Geological Institute, Vienna:

Verhandlungen, 1895, Nos. 10–17 u. 18.

From the K. und K. Militär-Geograph. Institut, Vienna:

Astronomisch-Geodätische Arbeiten, Band V und VI.

From the American Colonization Society, Washington:

Liberia. Bulletin No. 8, Feb., 1896.

From the Anthropological Society, Washington:

The American Anthropologist, Vols. I–VIII; Vol. IX, Nos. 1, 2, 3, Jan.–Mar., 1896.

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Monthly Bulletin, for November and December, 1895, January and February, 1896; Annual Report of the Director of the Bureau for the Year 1895; Bulletin No. 60, 1892, Peru. Revised to May 1, 1895.

From the Bureau of Education, Washington:

Report of the Commissioner of Education for the Year 1892–93, 2 vols.; The Science of Nutrition, by Edward Atkinson (2 copies).

From the U. S. Hydrographic Office, Washington:

Charts: No. 1436, N. America, Michigan, St. Mary's River, Hay Lake Channel; No. 1462, Canada, Lake Ontario, Toronto Harbor; No. 1469, Canada, Lake Huron, Georgian Bay, Cabot Head to Boucher Point; No. 1496, Central America, Gulf of Honduras with the Zapotillos Cays; No. 1497, Central America, East Coast of Honduras, Negro Head to Turneffe Cays; No. 1513 (2 in 1), South America, Dutch Guiana, Entrance to Coppermame and Saramacca Rivers—Guiana, Entrance to Corentyn River; No. 1517, Central America, East Coast, Nicaragua, Pearl Cays and Approaches to Pearl Cay Lagoon; No. 1518, S. America, Argentina, Port San Antonio; No. 1519, S. America, Argentina, Rio Negro; No. 1520, S. America, East Coast of Brazil, Port of Camamu; No. 1521, S. America, Argentina, San Blas Harbor; No. 1522, S. America, East Coast of Brazil from Bahia to Ilheos Anchorage; No. 1523, West Indies, S. Coast of Cuba, Port Santa Cruz del Sur; No. 1524, S. America, Brazil, Port Tamandara; No. 1525, S. America, Argentina, Gulf of St. George, Gill Bay, Egg Harbor, and Cayetano Bay and Approaches; No. 1526, S. America, Argentina, Gulf of St. George, Tova Island Anchorages; No. 1527, S. America, Brazil, Port Aracaju (Cotinguiba River); No. 1528, Japan, East Coast of Kiushu, Hososchima Harbor; No. 1529, S. America, Peru, Zorritos Anchorage; No. 1530, Submarine Cables of the World, with Principal Connecting Land Lines, etc.; E., Index to Coast, Special and Harbor Charts, Great Lakes.—Pilot Charts: North Atlantic Ocean, January, February and March, 1896; North Pacific Ocean, January, February, March and April, 1896.—H. O. Publications, No. 96, Edition of 1891, Supplement, 3d Ed. Coast of British Columbia, Juan de Fuca Strait, etc.; No. 105, Edition of 1893, Supplement, West Coast of Africa from Cape Spartel to Cape Agulhas; Catalogue of Charts, Plans, Sailing Directions and other Publications of the U. S. Hydrographic Office, Jan. 1, 1896; Sailing Directions, No. 108, Part IV, Lake Erie and Lake Ontario, etc.

From the Department of the Interior, Washington :

Report on Crime, Pauperism and Benevolence in the United States at the Eleventh Census 1890, Part II. General Tables.

From the Interstate Commerce Commission, Washington :

Preliminary Report on the Income Account of Railways, June 30, 1895.

From the National Geographic Society, Washington :

National Geographic Magazine, Vol. VII, 1896, Nos. 1, 2, 3.

From the U. S. National Museum, Washington :

Report for 1893; Proceedings, Vol. 17, 1894; Bulletin No. 48; Parts H., I., J. and K. of Bulletin No. 39, Directions for Collecting Minerals, etc.

From the Office of Naval Intelligence, Navy Department, Washington :

Notes on the Year's Naval Progress, July, 1895.

From the Smithsonian Institution, Washington :

Smithsonian Contributions to Knowledge: No. 989, The Composition of Expired Air and its Effects Upon Animal Life, by J. S. Billings, M.D., S. Weir Mitchell, M.D., and D. H. Bergey, M.D. (1895).

From the Department of State, Washington :

Consular Report No. 184, Jan., 1896; History of the Participation of the United States in the Columbian Historical Exposition at Madrid, 1892, by Stephen B. Luce; Report upon the Collections exhibited at the Columbian Historical Exposition at Madrid, 1892, by Daniel G. Brinton; Report of William E. Curtis, Assistant to the Commissioner General, etc., at Madrid, Spain, 1892; Fur Seal Arbitration. Proceedings of the Tribunal of Arbitration at Paris, 1893, Vols. 9–15, and Supplementary Volume.

From the Weather Bureau, Washington :

Monthly Weather Review, August, September and October, 1895.

From the Nassauischer Verein für Naturkunde, Wiesbaden :

Jahrbücher, Jahrgang 48, 1895.

From the Asiatic Society of Japan, Yokohama :

Transactions, Vol. XXIII, December, 1895, and Supplement, December, 1895.

TRANSACTIONS OF THE SOCIETY.

JANUARY–MARCH, 1896.

The Annual Meeting of the Society was held at Chickering Hall, Monday, January 13, 1896, at 8.30 o'clock P.M.

President Daly in the chair.

The following persons, recommended by the Council, were elected Fellows of the Society:

Hull Fanton. Clarence McK. Lewis. Dr. Franz Boas.

The Annual Report of the Council was then presented and read:

To the American Geographical Society:

The Council respectfully submits the following Report for the year 1895:

The number of Fellows on the 1st of January was 1,228, of whom 295 were Life Fellows. Seventy Fellows were elected during the year. The reductions by death, resignation, etc., were 149, and the whole number of Fellows at the close of the year was 1,149.

The Council has again to congratulate the Society on the condition of its finances. It has received from the executors of the late Vice-President, Maj.-Gen. Geo. W. Cullum, U.S.A., the full amount of the One Hundred Thousand dollars bequeathed in his Will towards providing, in part, for a fire-proof building for the security of the Library and valuable collections of the Society. The Council does not yet find itself, however, in a position to recommend to the Society the acquisition of a site and building for the purposes named in Gen. Cullum's munificent bequest. In the meanwhile the funds are invested in bonds secured by mortgages on real estate in the City of New York and its vicinity, guaranteed by Trust Companies, in whose solvency the Council has full confidence.

The accumulation of interest on the Cullum Geographical Medal Fund will, it is anticipated, soon justify the Council in entering upon the preparation of a design for the medal and proceeding to make the award.

The modifications in the manner of publication of the Bulletin have been, it is believed, for the better, and the suppression of the Supplement formerly issued as a separate number (No. 4. Part 2), has met with general approbation.

Towards the end of the year the public interest in the disputed boundary between British Guiana and Venezuela brought an unusual number of visitors to the rooms of the Society, for the purpose of consulting maps and atlases, of which our collection is very full and rich. This number of visitors has emphasized the need for increased accommodation, and it is hoped that the Society may soon be placed, by the generosity of friends, in a position to take steps towards the acquisition of a fire-proof building of ample size, worthy of the American Geographical Society.

In reviewing the work of the past year the Council dwells with peculiar satisfaction upon its prompt initiative in calling the attention of the American public to the necessity of despatching a vessel to Greenland to rescue the heroic Peary and his companions from what proved to be a position of the most imminent peril. The matter attracted the attention of the American Museum of Natural History and its friends and particularly its President, Mr. Morris K. Jesup, who generously furnished the main part of the necessary funds and also relieved Mrs. Peary and Mr. Diebitsch of much of the labor and care of organizing the expedition.

The additions to the Library number 2,896, viz.: Books 514, Pamphlets and Periodicals 2,215, Atlases 24, Maps and Charts 143.

The cash balance in the hands of the Treasurer on the 31st of December was $14,069.49, as appears by his report, herewith submitted.

All of which is respectfully submitted.

(Signed) HENRY PARISH,
Chairman.

New York, Jan'y 4, 1896.

The Report of the Treasurer was then presented and read:

REPORT OF THE TREASURER FOR THE YEAR 1895.

NEW YORK, January 1, 1896.

To the American Geographical Society:

The Treasurer respectfully reports the following Receipts and Expenditures of the Society for the year ending December 31, 1895:

The balance in the Union Trust Co., January 1, 1895, was...		$3,767.70
The Receipts have been:		
Dues	$9,020.00	
Interest	5,975.01	
Sale of Publications	119.50	
Miscellaneous	9.70	
		15,124.21
		$18,891.91
There have also been received:		
From the Estate of Gen. Cullum	100,000.00	
From Title Guarantee and Trust Co., mortgage investment paid off	1,500.00	
From U. S. Mortgage Co., withdrawal of deposits	34,750.00	
And Interest on the Cullum Medal Fund	164.66	
		136,414.66
		155,306.57
The Expenditures have been:		
House account	509.80	
Salaries	4,974.00	
Library	1,488.49	
Lectures	930.67	
Publications	2,052.49	
Stationery and postages	461.05	
Insurance	217.88	
Exploration account	1,000.00	
Miscellaneous	52.70	
There has also been paid for guaranteed mortgages on property in New York City and its vicinity	129,550.00	
There remains on deposit in Union Trust Co. January 1, 1896	14,069.49	
		155,306.57

(Signed) WALTER R. T. JONES,
Treasurer.

The Committee charged with the duty of selecting candidates for the offices to be filled reported the following:

REPORT OF THE NOMINATING COMMITTEE FOR 1896:

To the American Geographical Society:

The Committee appointed by the Council December 7, 1895, to nominate suitable persons to fill the offices which become vacant in January, 1896, respectfully recommend the election of the following gentlemen:

For President—CHAS. P. DALY, LL.D., term to expire January, 1897.
For Vice-President—REV. C. C. TIFFANY, D.D., term to expire January, 1899.
For Treasurer—WALTER R. T. JONES, term to expire January, 1897.
For Domestic Corresponding Secretary—
JAMES M. BAILEY, term to expire January, 1899.
For Councillors—REAR-ADM. BANCROFT GHERARDI, U. S. N.,
WILLIAM G. HAMILTON,
HENRY HOLT,
CLARENCE KING,
CHARLES A. PEABODY,
Terms to expire January, 1899.

(Signed) CHANDLER ROBBINS, *Chairman,*
LEVI HOLBROOK,
FRANCIS M. BACON,
Nominating Committee.

On motion, duly seconded, Mr. Banyer Clarkson was authorized to cast the vote of the Society for the candidates, and they were declared duly elected.

The President then introduced the speaker of the evening, Mr. Cyrus C. Adams, who delivered a lecture on Progress in Africa.

On motion, the Society adjourned.

A Regular Meeting of the Society was held at Chickering Hall on Monday, February 10, 1896, at 8.30 o'clock P.M.

President Daly in the chair.

The following persons, recommended by the Council, were elected Fellows of the Society:

James Owen, C.E. Thos. F. Burgess.
Henry Hartley, M.D., Vicksburg, Miss.

The President then introduced the speaker of the evening, Civil Engineer R. E. Peary, U.S.N., who addressed the Society on his Work in North Greenland in 1894 and 1895.

On motion, the Society adjourned.

A Regular Meeting of the Society was held at Chickering Hall, on Monday, March 9, 1896, at 8.30 o'clock P.M.

President Daly in the chair.

The President introduced the speaker of the evening, Prof. T. C. Mendenhall, late Superintendent of the U. S. Coast and Geodetic Survey, who addressed the Society on the Alaska Boundary Question.

On motion, the Society adjourned.

A Special Meeting of the Society was held at Chickering Hall, on Tuesday, March 24, 1896, at 8.30 o'clock P.M.

President Daly in the chair.

The following person, recommended by the Council, was elected a Fellow of the Society:

Edward F. Farquhar.

The President then introduced the speaker of the evening, Mr. C. E. Borchgrevink, who addressed the Society on the First Landing on the Antarctic Continent, its Results and the Coming Expedition.

On motion, the Society adjourned.

BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXVIII **1896.** **No. 2**

THE PHYSICAL GEOGRAPHY OF NEW YORK STATE.

PART I.—GENERAL PHYSIOGRAPHIC FEATURES.*

PAGE
Physiographic Provinces 102
  General Division 102
  Long Island Province 102
  Gneissic Highland Province 102
  Taconic Province 104
  Catskill Province 105
  New York-Pennsylvania Plateau Province 106
  Lake Shore Plains Province 107
  Mohawk Valley Province 108
  Adirondack Province 109
  Summary Statement of Geographic Provinces 110
Drainage of the State 111
  Lakes 111
  The St. Lawrence 112
  The Hudson 113
  Other Drainage Systems 113
  Gorges and Waterfalls 114
  Peculiar Importance of the New York Drainage 114
Physiographic Features Illustrated in New York 115
Geological Development of the State 116
  Deposit and Folding 116
  Final Uplift 121
  Post Palæozoic Denudation 123
  Ice Invasion 124
Climate of the State 125

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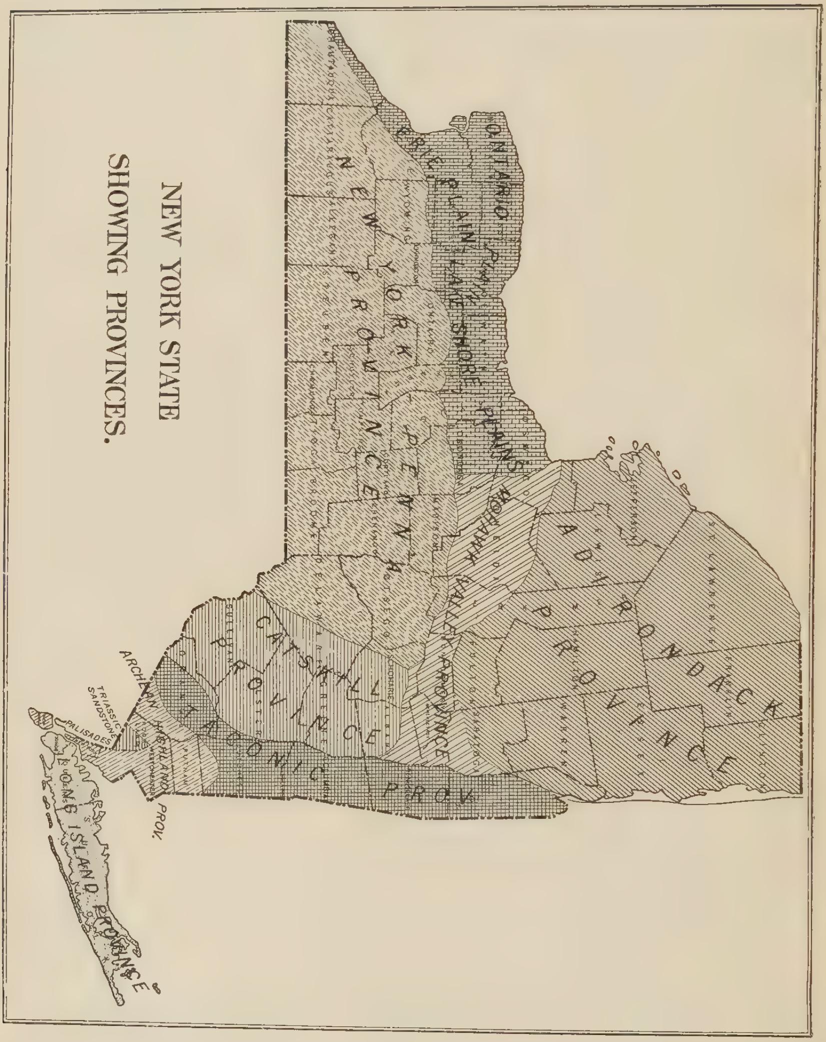
* In later pages references are made to special discussions of individual features. General descriptions are found in the following: Eaton, Geological and Agricultural Survey of the District adjoining the Erie Canal in the State of New York, Albany, 1824.

Henry, Trans. Albany Inst. I, 1830, 87–112.

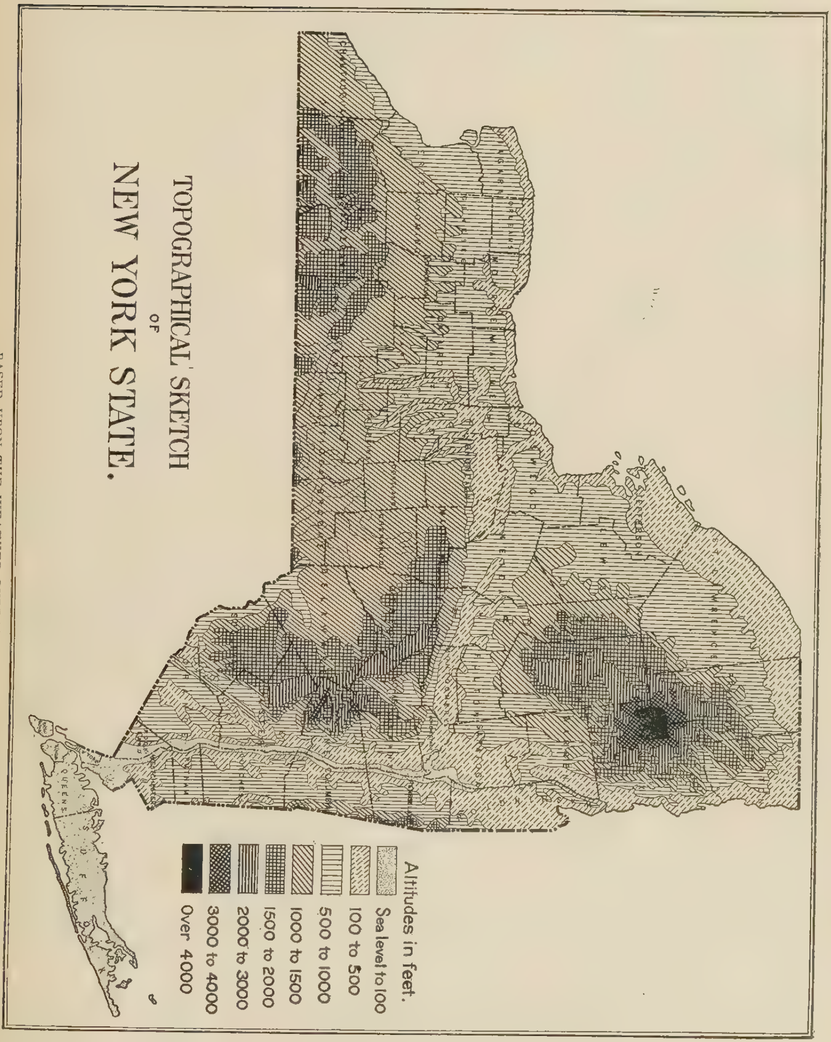
Natural History of New York, Geology, Part I, Mather; Part II, Emmons; Part III, Vanuxem; Part IV, Hall, 1842–3.

Emmons, Natural History of New York, Agriculture; Vols. I–IV, 1846–1851.

New York State Museum, Report 47, 1894, Albany.



NEW YORK STATE
SHOWING PROVINCES.



BASED UPON THE WEATHER BUREAU MAP.

PHYSIOGRAPHIC PROVINCES.

General Division.—On its northern side the State of New York is very naturally bounded for the greater part of its distance; but nearly everywhere else the boundaries are purely artificial. In consequence of this, most of the physiographic provinces of the State are merely portions of larger areas which extend into it from the neighboring States. Viewed broadly, and excluding the New England border, there are two highland areas and one branching area of lowlands. If the sea should rise only a few hundred feet, it would extend up the Hudson valley and across the divide into the basin of Lake Champlain, thence into the St. Lawrence and Lake Ontario. At the same time, it would reach up the Mohawk and meet the waters of Lake Ontario, passing across the divide at Rome. So the Adirondacks would become an island, separated from the Green Mountains of Vermont by a narrow channel, from the Highlands of Canada by a broad strait, and from the Catskills and the plateau of central and southern New York by a strait of intermediate width. As a result of this change the Long Island province would be entirely submerged in the sea.

Long Island Province.—Examining the topography of the State in a little more detail, we find these highland and lowland areas capable of considerable subdivision. There is first the sandy lowland of Long Island, barely separated from the mainland, yet quite distinct from it in its general features of outline and in its rock structure. The highest elevation is about 380 feet, and the plains average only about 70 feet above sea level.* It is really a northward extension of the coastal province of New Jersey, but its surface is considerably modified by deposits of glacial drift.†

Gneissic Highland Province.—Passing to the mainland, there commences a province of complex structure, and one in which, in the main and most typical part of the province, the rocks for the most part are very much folded and disturbed metamorphic strata of ancient date. These rocks are really an extension of the Highlands of New Jersey,‡ which reach across the southern angle of New York, extend northward and enter Connecticut. Besides these Archean gneisses, there is some sandstone* and a black diabase or trap, which forms the Palisades,† besides extensive layers of limestone, gneiss and schist, which extend across the region occupied by the City of New York.‡ This whole series of strata is intricately associated.

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* Am. Journ. Sci. XIII, 1877, 235.

† Upham, Am. Journ. Sci. XVIII, 1879, 81–92; 197–209; Mather, Geol. of New York, Part I, 1843, p. 161; 248–278.

‡ Chiefly described in New Jersey Geological Survey Reports. See also Pierce, Am. Journ. Sci. II, 1820, 181–199; same V, 1822, 26–33; Eaton, same V, 1822, 231–235; Shepard, same XXI, 1832, 321–334.

Excepting at the very seashore line, the province is a moderate highland, with rather rough topography and with hills rising in some places to an elevation of 1,000 or 1,200 feet above sea level. Where there is limestone or sandstone in this area, there is usually a lowland, while highlands occur wherever the hard gneiss comes to the surface not immediately at the seashore. This is extremely well illustrated in Rockland County, where the gneissic Ramapo Mountains are faced at their south-eastern base by a lowland, a somewhat rolling plain, which, however, is bounded on its eastern margin by another highland where the trap of the Palisades rises close by the Hudson River. At many points along the eastern boundary of this highland region the Ramapo Mountains rise to a height of 1,100 or 1,200 feet above sea level, while the average elevation of the hills on the sandstone plain at its base is not more than one-half this; but the highlands of the Palisades in some places rise to 700 or 800 feet above the sea.

It would be possible to subdivide this second province; and indeed this would be necessary if we were to extend this examination of the surface into minute details. There are: (1). The low hills and highlands of the immediate coast, including all of New York County and a part of Westchester County. There is then: (2) the Palisade range of trap rock, and (3) the small angle of Triassic sandstone which extends from New Jersey into New York as a wedge-shaped area of undulating plain—a low hilly province in the apex of the angle between the Palisade and the real gneissic highlands. West of this is: (4) the gneissic highland proper in western Rockland, eastern Orange and a large part of Putnam Counties. This portion of the province forms the western member of the general highland area. The Hudson River crosses it, cutting the strata diagonally and so trenching the highland area throughout its width. The axes of the folds, which prevail in this complex region, are almost uniformly northeast and southwest and the folding has been extremely complex.

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* Mather, Geology of New York, Part I, 1843, 285–294; Russell, Annals, N. Y. Acad. Sci. I, 1879, 220–254; Russell, Bull. 85 U. S. Geol. Survey, 1892.

† Mather, Geology of New York, Part I, 1843, 278–85; 465–487; 534–541. Wurtz, Proc. New York Lyceum Nat. Hist., I, 1870, 99–105.
Darton, Bulletin 67, U. S. Geol. Survey, 1890.

‡ Mather, Geology of New York, Part I, 1843, 441–464; 525–534; Gale, in same, 581–604; Britton, Annals N. Y. Acad. Sci., II, 1882, 161–184; Transactions of same, VI, 1886, 12–18. See also references for Taconic Province (p. 104). Kemp, Trans. New York Acad. Sci., VII, 1887, 49–64.

*Taconic Province.**—West of this gneissic highland is an area of folded rock, which, compared with the gneissic highland in the southern part, is itself a lowland. It extends as a broad valley northward from Pennsylvania, across New Jersey and into Orange County, New York, then, crossing the Hudson, it skirts the boundaries and extends into the States of Connecticut, Massachusetts and Vermont. The rocks are mostly shales, slates, schists and limestones; but in the northern portion some of the strata are durable quartzite and even gneiss. While the topography is that of a valley in the southern portion, this province in the northern part becomes transformed into a region of highlands, and indeed of real mountains. This is true of the Taconic range, on the boundary between Massachusetts and Rensselaer County, which rises to an elevation of more than 2,800 feet above sea level. This same range extends along the axis of the Green Mountains, and passes across the Canadian line at the boundary with Vermont.

Throughout its entire extent the rocks of this province are folded, and the topography hilly; but in the southern part it is a gently undulating, broad valley between two highlands, because its rocks are softer and more easily denuded than the bounding strata. Towards the northeast, near the Massachusetts and Vermont boundaries, metamorphism has altered these strata until they are harder than the surrounding rocks; and hence they form true mountains, sloping on the one side toward the valley of the Hudson and on the other toward the Connecticut. After passing the latitude of the boundary between Vermont and Massachusetts, this province is almost entirely within the State of Vermont; for the Lake Champlain depression marks the western boundary. From near Catskill, northward to Glen's Falls, the Hudson may be considered as the approximate western boundary of this area. South of Catskill the Hudson turns away from the boundary, enters the area and crosses it, then enters and extends across the gneissic highlands. While, especially in the north, the rocks in the Taconic area are considerably metamorphosed, sometimes even past recognition of their original condition, in the south they become less and less changed; and there (as well as in a few places to the north) we are able to see that they are members of the Cambrian and Lower Silurian periods. On page 118 it is shown that the rocks of this area were all folded at one time; and hence the area may be properly separated from the complex gneissic province.*

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* The Taconic area has served as the basis for an extremely prolonged controversy. The reports of the Geological Surveys of Vermont, Massachusetts and Connecticut contain facts upon this province. Besides these, reference may be made to the following: Dewey, Am. Journ. Sci. II, 1820, 246–249. Barnes, Am. Journ. Sci. V, 1822, 8–21. Dewey, Am. Journ. Sci. VIII, 1824, 1–60; 240–244. Emmons, Geology of New York, Part II, 1842, 135–164. Mather, Geology of New York, Part I, 1843, 366–438. Dana, Am. Journ. Science, XIV, 1877, 37–48; 132–140; 202–7; 257–64; XVII, 1879, 375–388; XVIII, 1879, 61–64; XIX, 1880, 153–155 (contains a Bibliography); 191–200; 236–237; XX, 1880, 21–32; 194–220; 359–375; 450–456; XXI, 1881, 425–443; XXII, 1881, 103–119; 313–315; 327–335. Dwight, Am. Journal Science, XVII, 1879, 389–92; XIX, 1880, 50–54; 451–453; XXI, 1881, 78–79. Dale, Am. Journal Science, XVII, 1879, 57–59. Ford, Am. Journ. Sci. XIX, 1880, 225–226. Dale, Thirteenth Annl. Rept. U. S. Geol. Survey, 1893, 291–340. Pumpelly, Wolff and Dale, Monograph XXIII, U. S. Geological Survey, 1894, Washington, D. C.

Catskill Province.†—The folded rocks of the Appalachians enter this State in western Orange and eastern Sullivan Counties; and in this region the folds have determined a series of ridges which make this part of the State a truly mountainous section, notably in Shawangunk Mountain, where a tilted conglomerate rock caps the ridge.‡ West and north of this the strata are less disturbed, and are for the most part in a horizontal position.

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* Some may question the value of a separation of these eastern folded sections into two provinces; and, so far as New York is concerned, the division would not be warranted. Really the folding of the Taconic rocks involved the eastern gneissic highlands also, and the rocks of Westchester County are mostly of this age. The true Taconic Province therefore divides in Putnam County, one portion passing southwards into Westchester County (see articles by Dana referred to on p. 104. See also Prosser, Trans. New York Acad. Sci. XI, 1892, 132–149). The place of division is the older Archean and younger sedimentary areas. One might therefore speak of the whole eastern margin of the State, exclusive of Long Island, as the Taconic area, which extends eastward at least as far as the Connecticut. This could then be subdivided into (1) the eastern, Westchester County Taconic, (2) the Palisade range, (3) the Triassic sandstone, (4) the Archean Highlands, and (5) the main Taconic area, mountainous in the north and lowland in the south.

† Dwight, Am. Journ. Sci. II, 1820, 11–29. Barton, Am. Journ. Sci. IV, 1822, 249–251. Pierce, Am. Journ. Sci. VI, 1823, 86–97. Vanuxem, Geology of New York, Part III, 1842, 186–194. Mather, Geology of New York, Part I, 1843, 299–316. Hall, Proc. Am. Assoc. Adv. Sci. XXIV, 1875, Part 2, 80–84. Guyot, Am. Journ. Sci. XIX, 1880, 429–451. Julien, Trans. New York Acad. Sci. I, 1881, 24–27; Newberry, same, 28–31. Darton, Report 47, New York State Museum, 1894, 485–566.

‡ See Mather, Geology of New York, 1st District, 1843, pp. 355–7.

Darton, Nat. Geog. Mag. VI, 1894, 23–34; New York State Museum Report 47, 1894, 485–566.

Being in this place made of durable sandstones and conglomerate, and being very much carved by denudation, this plateau region has the appearance of real mountains; and some of the peaks are more than 3,500 feet, and one even 4,205 feet above the sea level. In the southeastern part of the province, where the rocks are really folded, the hard strata stand up in the form of mountain ridges. In this province the rocks are sandstones, conglomerates, shales and limestones of the Devonian age; and where there are folds* they are essentially like those of the plateau west of this province, excepting that they are more intense. Both in the north and in the west, they gradually disappear, and the mountainous region in both of these directions is gradually replaced by a plateau. The western boundary of the Catskill province is not easily drawn with definiteness; but the eastern boundary is marked by a quite continuous highland overlooking the lower region of the Taconic province, and the north by a strongly developed escarpment, the Helderberg (see pages 107, 124).

This province might also be subdivided. It is the only truly mountainous portion of the State made out of rocks later than the lower Silurian. It might be divided into (1) the folded, southeastern portion and (2) the deeply dissected Catskill plateau area.

New York-Pennsylvania Plateau Province.†—West of this, and occupying fully one-third of the State, is a great plateau region, often deeply dissected by numerous broad river valleys. It is made entirely of Devonian rocks, mostly upper Devonian shales and sandstones, in which, however, there are some strata of limestone. The strata of this province are in a nearly horizontal position, in this respect differing from the previous province, with the exception of a part of the Catskills.‡ This fact of the horizontality of the rocks determines the extensive plateau character of the province, a feature which extends southward, across the Pennsylvania line, along the western base of the Appalachians. Throughout the New York section of the plateau, the hill tops quite commonly rise to elevations of 1,500 to 2,000 feet, and the average elevation above the sea level cannot be less than 1,000–1,200 feet. From the valleys this does not resemble a plateau, but rather a mountainous country; for the hills often rise to heights of 1,000–1,200 feet above the low valleys. Upon the tops of the hills one is able to see that this is really a plateau region very much cut by stream action, and carved by denudation, into a maze of hills, many of which are capped by the harder layers of nearly horizontal rocks.

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* Hall, Am. Assoc. Adv. Sci. XXIV, 1875, Part 2, 80–84.

† Mather, Geology of New York, Part I, 1843, 317–365; Hall, same, Part II, 1843. Also Williams, Bull. 80 U. S. Geol. Survey, Washington, 1891.

‡ There are some gentle folds and faults. See Hall, Geology of New York, Part IV, 1843, 163; 213; Williams, Proc. Am. Assoc. Adv. Sci. XXXI, 1882, 412. Some of these undulations may be due to removal of beds of salt from beneath.

Considered as one great dissected plateau, its surface undulates somewhat. Where the branches of the Susquehanna head against the headwaters of the Finger Lake streams, the plateau level is somewhat depressed.* It sags in the middle, being higher near the western base of the Catskills and lower in the Finger Lake region; then, rising again, it reaches a high elevation in Cattaraugus County, in western New York. Beyond this, in Chautauqua County, and westward in Pennsylvania, the plateau level again descends. Excepting near the Catskills, the highest portions of this plateau are in Cattaraugus and Allegany Counties in New York, and the adjoining counties of McKean and Potter in Pennsylvania.

On its northern face the plateau ends in an escarpment, which, though irregular and somewhat serrated, is commonly quite pronounced. Its position in the east is determined by the hard Helderberg limestone;† but in the extreme west it is determined by the two sets of shales, the upper and more durable ones and the lower fragile beds. Along the Erie shore, near the boundary between New York and Pennsylvania, the escarpment is about two or three miles from the lake; but going toward the east the escarpment recedes from the lake. In some cases it is very abrupt, and in Chautauqua County, it ascends to a height of 500 feet in a very short distance. The escarpment is less distinct in Erie County, but becomes more and more pronounced toward the east, and in Seneca and Cayuga Counties, it is a distinct escarpment, while east of this it becomes sufficiently high to form the Helderberg Mountains. Therefore, for the greater part of the distance, the northern boundary of the Catskill and Plateau provinces is a single deposit of limestone, which in some places rises 1,000 feet above the plain below.

Lake Shore Plains Province.‡—At the base of the escarpment, north of the plateau, there is always found one or more plains. In the west, on the Erie shore, the escarpment is bounded at its base by a very narrow strip of plain, which gradually descends below the lake level. This plain widens toward the east, extending from the escarpment south of Buffalo to Lewiston and Lockport. The Niagara River, from Lake Erie to the Falls, crosses on the surface of this plain, then, dropping over the Falls, the river courses along in a gorge which has been cut into the plain.* Here and elsewhere we find that the strata are horizontal.† This plain crosses the Niagara River into the Province of Ontario,‡ and indeed extends beneath the waters of Lake Erie; for the bottom of this lake is really only a part of this plain.

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* See Lincoln, Am. Journ. Sci. XLIV, 1892, 290.

† Vanuxem, Geology of New York, Part III, 1842, 24; Darton, Report 47, New York State Museum, 1894, 394–396; 427–428.

‡ Hayes, Am. Journ. Sci. XXXI, 1837, 241–247; Vanuxem, Geology of New York, Part III, 1842, various pages; Hall, Geology of New York, Part IV, 1843, various pages.

Along the western shore of Lake Ontario, the plain just described is terminated on the northern margin by a rather abrupt escarpment, sometimes two or three hundred feet in height. This has its position determined by the very durable stratum of Niagara limestone, upon which the Falls are now situated, and by which their height and position are determined. In the east this escarpment gradually disappears and the two plains merge into one. This province may best be seen from the heights of Queenstown and Lewiston (called "The Mountain") on the Niagara River. There, stretching eastward toward Lockport, and westward into the Province of Ontario, is the Niagara escarpment; south of this, toward Buffalo, is the nearly level upland plain, the Erie plain; and northward, stretching from the very base of the bluff, is another remarkably level plain, which, extending along the shores of Ontario, may be called the Ontario plain. Its width varies from 4 to 9 miles. Beyond this, to the north, the level descends rapidly beneath the lake waters, and ten miles from the shore, the depth is 500–600 feet. In the east these plains become more hilly, and as a distinctive province, it disappears at about the longitude of the eastern end of Lake Ontario. Northward from this the plains extend into a series of hills which face the western base of the Adirondacks; and eastward they extend into the valley of the Mohawk, which is made the next province.

Mohawk Valley Province.§—East of Oneida Lake and Rome, there is a good-sized valley between the Adirondack Mountains on the north and the Plateau and Catskill Provinces on the south. It is a broad, well-developed valley, irregular and hilly, and cut out of shales and limestones for the most part, though in one or two places the river has cut down into gneiss. While commonly horizontal, the rocks of this district are somewhat disturbed in places, particularly on the northern boundary, where they merge into the Adirondack Province. It is in such places, as at Little Falls, that the river, cutting into an uplifted portion, has reached down to the gneiss which probably underlies the entire valley as a subterranean continuation of the Adirondack region.

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* For a geological section in well-borings in this plain, see Ashburner, American Inst. Mining Eng., VII., 1888–89, 398–406.

† In a few places local folding is detected. See Hall, Geology of New York, Part IV, 1843, 295–298; Gilbert, Proc. Am. Assoc. Adv. Science, XL, 1891, 249–250.

‡ See Hunt, Am. Journ. Sci. XLVI, 1868, 355–362.

§ Vanuxem, Geology of New York, Part III, 1842, 20–21; 203–211. Darton, Report 47, New York State Museum, 1894, 603–623.

This province is the least characteristic of all that are named. Its boundaries are often indistinct, merging imperceptibly into the neighboring provinces; but there are parts of the valley which are distinctly separated from either of the bounding areas; and hence, for the sake of defining the topographical features, it may be classed as a separate province, although with the distinct understanding that it is not equal in value to some of the other divisions. On the east the Hudson River forms the natural boundary, and on the south, the escarpment.

*Adirondack Province.**—This, which is nearly as large as the Plateau Province, is second in size of the several divisions proposed. It is a nearly circular area of metamorphic and igneous rocks, mainly gneisses, granites, gabbros, norites and other plutonic or very much metamorphosed rocks. The area of metamorphic rocks is skirted by a collar of sedimentary strata of Lower Silurian and Cambrian age, which, though not so much metamorphosed, nor so greatly disturbed in position, are nevertheless to be considered a part of the Adirondack Province. In this area is then included the hilly, though lower land bordering the St. Lawrence and the western base of the Adirondacks along the shore of Ontario, as well as the hilly section on the southern boundary and along the shores of Lakes George and Champlain. The central and typical part of the province consists of a series of grand mountain masses, usually with flowing outlines and rising, in several places, to a height of over 5,000 feet, while Mt. Marcy,* the highest peak, reaches an elevation of 5,379 feet above sea level. The eastern central portion is a central divide region, from which the streams radiate outward in all directions. In their course they are often very much disturbed by glacial deposits, and hence lakes are extremely abundant in these mountains.†

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*Steele, Am. Journ. Sci. IX, 1825, 1–4. Finch, Am. Journ. Sci. XIX, 1831, 220–228. Redfield, Am. Journ. Sci. XXXIII, 1838, 301–323. Emmons, Geology of New York, Part II, 1842, various pages. Vanuxem, Geology of New York, Part III, 1842, various pages. Guyot, Am. Journ. Sci. XXXI, 1861, 157–187. Kemp, Trans. New York Acad. Sci. XII, 1892, 19–24 (Bibliography). Van Hise, Bulletin 86, U. S. Geol. Survey, 1892. Smyth, Trans. New York Acad. Sci. XII, 1892, 97–108. Kemp, Report 47, New York State Museum, 1894, 625–666; Cushing, 667–683; Smyth, 685–709.

Summary Statement of Geographic Provinces.—Thus New York may be divided into eight provinces, every one of which except the last two, is only partially in this State. These are:

(1) The Long Island area, which is the northeastward continuation of the Tertiary and Cretaceous plains of New Jersey, and is composed of soft rocks covered by thick deposits of glacial drift. (2) The Gneissic Highland Province, which typically is made of highly metamorphosed rocks, folded into complex positions and with a general north-east and south-west strike. This may be subdivided into (*a*), the low hilly coastal portion; (*b*) the Palisade range; (*c*) the Triassic sandstone plains; (*d*) the true Gneissic Highlands, each of which extends from New Jersey into New York, while the main Gneissic Highland area passes north-eastward into New England. East of this is (3) the Taconic Province, a region of soft shales, slates, schists and limestones forming a valley in the southern part, but rising in the form of true mountains in the northern more highly metamorphosed part. This province also crosses the southern part of the State, entering it from New Jersey and passing into Connecticut, Massachusetts and Vermont.

West of this is (4) the Catskill Province, which is the north-eastward extension of the Appalachian folds and the high Appalachian plateau on the western base of these mountains. While in some places the rocks are tilted, in others they are nearly horizontal, in each case being sandstones, conglomerates, limestones and shales. This province is bounded on the north by the Mohawk Valley area and on the west by (5) the New York and Pennsylvania Plateau Province, into which it gradually and imperceptibly merges. In the plateau region the rocks are all Devonian, and mostly upper Devonian, while their position is horizontal or nearly so. This is faced on the north by an escarpment, at the base of which lies the (6) Lake Shore Plain Province, in which the rocks are also horizontal; but, instead of being a deeply dissected plateau, they are in the condition of a remarkably level plain, rising to no great height above the surface of the lakes. In the west this province is double, consisting really of two plains separated by an escarpment; but in the east it becomes less like a plain, where the plains of the two levels are joined as one by the disappearance of the escarpment. This then becomes more and more hilly toward the east and finally disappears in (7) the Mohawk Valley Province, which is a hilly valley region, set between the Catskills and the great Plateau Province on the one side and (8) the Adirondack Province on the other. This latter province is the most mountainous and the highest portion of the State. It may be fairly considered to be entirely within the State, although a very small part of its northern border really extends into Canada, across the east and west portion of the New York-Canada line.

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* See Emmons, Geology of New York, Part II, 1842, 218.
Colvin, Trans. Albany Inst. IX, 1879, 11–26.

† Emmons, Geology of New York, Part II, 1842, 171, 213–214, 415–416, 422–427.

The most typical provinces are the Adirondack and the Plateau areas. Omitting Long Island, one might with simplicity divide the State into but four provinces: (1) the Eastern folded region, extending from the Sound to the base of the Catskills; (2) the New York-Pennsylvania Plateau Province, including the Catskills proper; (3) the Lake Shore Plains; (4) the Adirondacks, using the Mohawk River as a boundary line between the second and fourth provinces.

We then have two areas of folded and contorted rocks (1 and 4), making considerably more than one-third of the State, and two areas (2 and 3) of nearly horizontal strata. In the folded parts the scenery is beautiful, the rock structure complex and the topography quite irregular, particularly in the Adirondack portion. In the two areas of nearly horizontal strata, the scenery is usually less varied, though sometimes quite mountainous, notably in the Catskills and in Cattaraugus County. With decrease in ruggedness, the value of the land for agricultural purposes increases; and so the best of the agricultural land is situated on the plateaus and plains, particularly in the lower and more level lands near the lakes.

DRAINAGE OF THE STATE.

Lakes.—The drainage of the State is very much interrupted by lakes, some of which present very interesting and even remarkable features. The lakes vary in size from Ontario, whose greatest length is over 180 miles with a width of 50 miles, to tiny ponds; and they vary in depth from mere shallow pools to Ontario, which in one place reaches a depth of 491 feet below sea level.* There are various types of lakes, but the prevailing feature throughout the State is the linear form, so typically illustrated in the group of Finger Lakes* which occupy the central depressed portion of the great Plateau Province, though not less so in Lakes Chautauqua, George, Champlain, and many of the Adirondack lakes. For the most part these lakes are plainly river valleys in which water has been made to collect because of their local transformation to basins.

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* Being 738 feet deep and the surface being 247 feet above sea level.

While the lakes of the State are well scattered over its entire area, they are, excluding Lakes Erie and Ontario, bunched with especial abundance in three parts of the State, namely, (1) the Finger Lake region of the Central Plateau, (2) the Adirondacks and (3) the mountainous and hilly southeastern part of the State, including the Catskills. In these areas, and particularly in the Adirondacks, lakes are present in great numbers. Among the Adirondacks alone, there are many hundreds of lakes, great and small, besides a great number that have been filled and changed to swamps and meadows.

The St. Lawrence. — The water that falls within the boundaries of New York passes outwards in all directions.† Not far from one-half of the State, and more than one-half of the Adirondacks, is drained through the St. Lawrence River. The divide between the St. Lawrence and southern drainage passes irregularly east and west from the northeastern part through the middle of the State, passing out of it in only one place, namely in the middle western portion, where the Genesee rises in Pennsylvania and flows northward entirely across the State, entering Lake Ontario. The part of the State that drains into the St. Lawrence system sends its waters to that river through numerous streams, most of which are very small. There are many hundreds of these that enter the Great Lakes or Lake Champlain or the St. Lawrence directly. The only two that are of good size are the Genesee, which rises in Pennsylvania, and flows northward, entering Ontario near Rochester, and the Oswego, which carries the waters of the Finger Lakes of central New York. The divide between the St. Lawrence and the southern drainage area is very irregular, being sometimes far from the St. Lawrence or from the Lakes; but in one place, in Chautauqua

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* Vanuxem, Geology of New York, Part III, 1842, 237–242. Hall, Same, Part IV, 1843, 321, 405–408. Lincoln, Am. Journ. Sci. XLIV, 1892, 290–301. Brigham, Bull., Am. Geograph. Soc. XXV, 1893, 16. Tarr, Bull. Geol. Soc. Am. V, 1894, 339–356.

† Ballou, Am. Nat. XIV, 1880, 139–140.

County, in western New York, it is within sight of Lake Erie and at a distance of not more than ten miles from it.

Not only are the tributaries of the St. Lawrence system frequently interrupted by lakes, but the main portion of this river has the same features even more markedly developed. The main valley is a series of lakes, the Great Lakes, of which two, Erie and Ontario, are partly within the boundaries of New York. In the case of Ontario the valley is made into a lake for a distance of more than 180 miles, with an average breadth of not far from 40 miles. Connecting Lakes Erie and Ontario is the Niagara River with its wonderful falls and gorge. At the other end of Ontario, the waters emerge through a region almost as remarkable as the gorge through which they enter it. The lake gradually merges into a river, its channel being clogged and dotted by hundreds of islands. The outlet of Ontario is at first a great bay, gradually becoming a river only after passing over a distance of many miles, dividing and ramifying between the Thousand Islands.*

The Hudson.—Next in area is the Hudson drainage, including its single great tributary, the Mohawk, which enters from the west. The eastern boundary of this river system is very nearly the boundary between New York and New England, now entering these border States, again entering New York. A considerable part of the Catskills and the Adirondacks are drained into the Hudson. This is the single large stream which is really a New York river. Unlike any other, it rises in the State, flows entirely within its area and enters the sea within the State boundaries. With the exception of a very little water received from the bordering States of New Jersey, Connecticut, Massachusetts and Vermont, the Hudson obtains all of its supply from New York.

The Hudson is notable for its remarkably straight course from the rectangular turn at Sandy Hill to the Sound, and also for its deep valley with steeply rising rock walls. The influence of the tidal rise and fall is felt as far as Albany, while navigation is possible even beyond this city. Above the mouth of the Mohawk the river is small and unimportant; and if it were not for the fact that the tide holds back the water of the Hudson, it would never have become the important commercial artery that it now is.

Other Drainage Systems.—The Delaware River rises in New York State, draining part of the Catskills, and the neighboring region, into the Atlantic through Delaware Bay; and further west the Susquehanna tributaries have their headwaters on the southern side of the St. Lawrence divide. These drain very nearly one-fourth of the State, competing with the St. Lawrence for the greater part of the central plateau. By the time the Susquehanna leaves the State of New York, it has become a large river and the waters are carried southeastward into Chesapeake Bay. Farther west, in Cattaraugus and Chautauqua Counties, the Allegheny River enters New York; and, after a short course within the State, it re-enters Pennsylvania, thus draining a small corner of the State into the Gulf of Mexico, through the Ohio and Mississippi.

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* Bigsby, Phil. Mag. Ser. IV, Vol. v, 1829, 1–15; 81–87; 263–274; 339–347; 424–431.

So the State of New York is a great divide region contributing water to no less than five well-known river systems, the St. Lawrence, Mississippi, Susquehanna, Delaware and Hudson, only one of which enters the sea in the State, or is even in large measure within its boundaries. A very little of the drainage of the State enters the sea through small streams in New Jersey and Connecticut. Therefore the water that falls on various parts of the State may enter the St. Lawrence, or it may pass over a much longer journey to the southward, possibly, even into the Gulf of Mexico.

Gorges and Waterfalls.—In many of the Northern States, waterfalls and gorges are notable and common features; but of none is this more true than of New York. Many of the streams, particularly those of the central plateau region, flow for a part of their distance in gorges and are interrupted by falls and rapids. Niagara is a type of these, which, though larger and more wonderful than its fellows, finds its counterpart in hundreds of places in other parts of the State. Among the Adirondacks and Catskills the streams are also tumbled into rapids or falls and are often found racing through gorges. A consideration of the causes for this peculiarity, as well as of the other physiographic features of the State, will be deferred until later papers.

Peculiar Importance of the New York Drainage.—Leaving out of question the æsthetic aspect of the drainage, for which the lakes, gorges and falls of New York are justly noted, and the commercial value of the water for power, there are several features of New York drainage which have had a unique influence upon the development of the State. A navigable river, the Hudson, reaches into the heart of the State, extending far up toward Lake Ontario. Indeed, with a canoe but a short portage is needed to reach this lake. As soon as the Indian obstacle was removed, these natural waterways served as a pathway into interior New York, and indeed to the west.

As the necessity for transportation to and from these interior colonies increased, because of the great natural facilities, it became possible to add to the readily navigable Hudson and the large lake a system of artificial waterways, the canals. So New York is ramified by these, the most remarkable of all being the Erie, which, emerging from Lake Erie near Buffalo, passes along the upper member of the Lake Shore Plains Province and extends with a remarkable levelness over this plain to the divide at the head of the Mohawk, down the valley of which it extends to the Hudson. This canal and its tributaries have done more to develop the resources of the State of New York than almost any other feature; and both the main canal and the branches depend for their location upon the peculiar configuration and drainage of the State.

By means of the natural and artificial waterways, it is possible to reach into the very heart of the country. For a while it seemed as if railways had done away with the necessity and value of canals; but by enlarging them, and particularly by the use of electric power for movement, the future of the great canals seems more promising than ever. No canal in this country offers better facilities for enlargement and greater need of this improvement than does the Erie, and it may safely be predicted that this will be done.

PHYSIOGRAPHIC FEATURES ILLUSTRATED IN NEW YORK.

About New York as a centre it would be possible to build a complete physical geography. Within the boundaries of the State there are illustrated very nearly all of the important groups of physiographic features. Among rivers there are various forms and types, and of lakes there are both an abundance and a variety of kinds. Of coastline features illustration is furnished not merely along the sea shore of Long Island and the very southernmost angle of the State, but also along the shores of the Great Lakes, and, in a smaller way, along the shores of the smaller bodies of water. Mountains find illustration in several types; and although volcanoes are absent, lava rocks are found in the Palisades of the Hudson and in various other parts of the State.* Plateaus and plains cover more than one-half of the State and they exhibit varied features, while instances of cliffs and escarpments abound.

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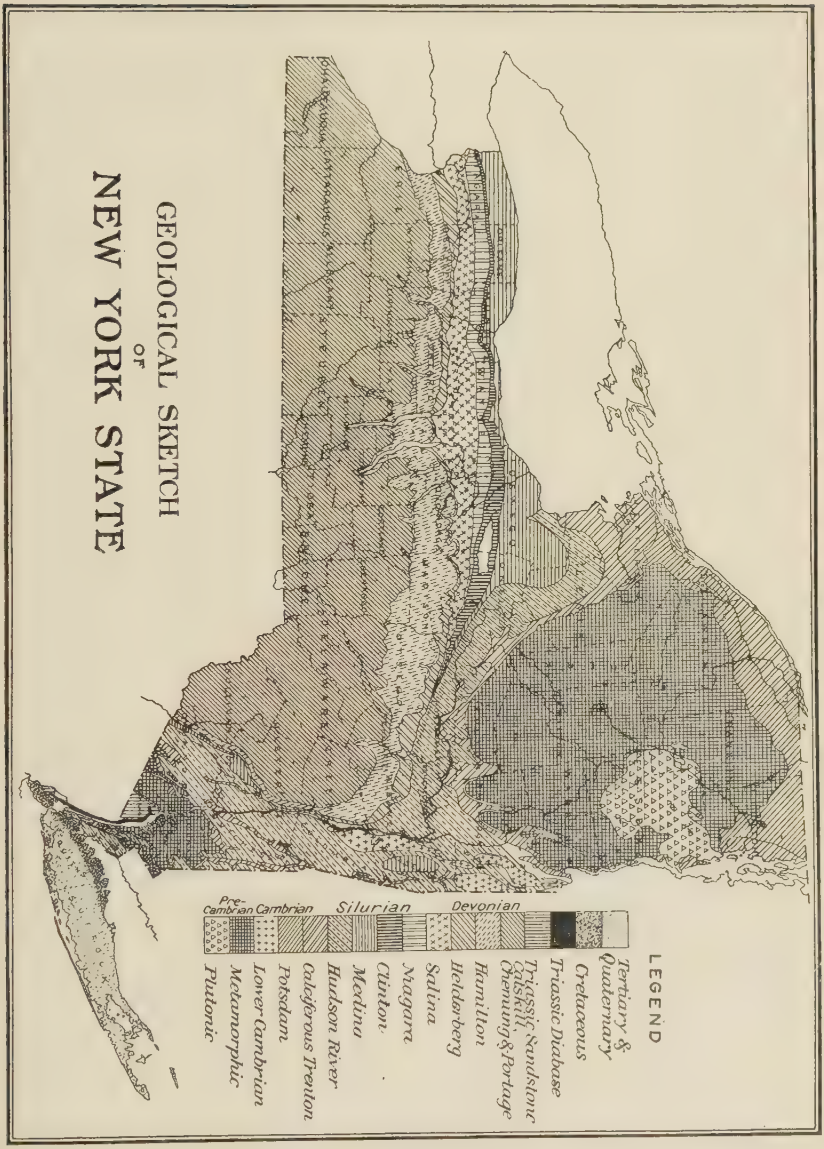
* See references on p. 103. Also, Kemp and Marsters, Trans. New York Acad. Sci. XI, 1891, 13–23.

Besides these greater earth features, there are many smaller ones, perhaps the most notable of which are those that have resulted from glacial action. There are terraces, ancient shore lines, various kinds of glacial hills and, indeed, illustrations of most of the features of the earth. In later pages of this discussion, these will be taken up for consideration. There are few States that offer within their own boundaries so rich an assemblage of physiographic illustration.

GEOLOGICAL DEVELOPMENT OF THE STATE.

Deposit and Folding.—The Adirondacks are distinctly the oldest large area in the State, the only possible competitor being the crystalline highland region of the southwestern corner of the State (the real gneissic part of the Highland Province), where the Archean rocks of the New Jersey Highlands extend across the New York boundary. At the beginning of the Palæozoic, both of these areas of crystalline rock were mountainous lands facing the sea, which stretched away to the westward, and beneath which all the rest of the site of New York State was submerged. The southwestern highland mountains extended northward into New England; and toward the east they probably reached seaward beyond the present coast line. This mountain range also extended southwestward along the eastern part of the sea-coast States, and west of it was a great sea in the present Mississippi Valley. Whether the Adirondacks and this highland mountain range were ever connected, and what was the actual former extension of the two areas, cannot be told in the present state of geological knowledge. The record of much of the early history has been hidden beneath the strata of later age.

However, in the very early Palæozoic the waves of the sea beat at the western base of the southern highlands and these were then at least separated from the Adirondack area, which was at this time an island in the Palæozoic sea. This is shown to be true by a ring of early Palæozoic sedimentary rocks, which practically surround the mountains and in which fossil beaches can now be plainly detected. Later folding has probably affected the Adirondacks, and it is also quite probable that parts of these mountains have since that time been submerged; but the main post-Archean history of the Adirondacks is that of long-continued denudation, as a result of which the elevation has been greatly reduced. Throughout much of the Palæozoic, and apparently throughout all of the post-Palæozoic time, these mountains have been subjected to constant denudation. The structure and detailed history of the Adirondacks are very



BASED UPON THE STATE MUSEUM MAP.

obscurely understood, and little except the most general facts are at present known concerning it.

Next in the development of the State came a great overturning of the rocks along a line parallel to and near the crystalline highlands of the southwest. Indeed, these were undoubtedly involved in this folding, which profoundly influenced the southeastern portion of the State and all of western New England and eastern New York. Indeed, from the neighborhood of Quebec, southwestward as far as Virginia, and apparently beyond, this period witnessed the growth of a great mountain system, which has been called the Taconic system by reason of the fact that the Taconic Mountains, of the New York-Massachussetts boundary, have furnished good evidences of this system of folding. The rocks involved in the overturning are the older, crystalline pre-Palæozoic rocks and the Cambrian and Lower Silurian sedimentary strata; and, as a result of the mountain growth, these have been extensively folded and even broken or faulted. Since the rocks of the Upper Silurian age rest unconformably upon the sides of these uplifted strata, the age of the Taconic Mountain uplift is placed near the close of the Lower Silurian. By the folding the rocks were also extensively metamorphosed, the limestones often being changed to white marble, the sandstones to dense quartzite, the shales to slates, etc.; and in some places the metamorphism has gone so far that the original rocks are now changed to schists and even gneisses.

The folding and faulting were more intense in the northern part of the State than near the New Jersey line, and more in the east than in the west; and hence the rocks are more metamorphosed, and therefore more durable in the northern than in the southern counties. In the south, in Orange County, the folded rocks are bounded on both the east and the west by harder strata, and hence denudation has lowered them into the condition of a valley. The real Taconic ranges, near the New York-Massachusetts boundary, and their continuation along the Green Mountains of Vermont, furnish illustration of good-sized mountains. This is especially true of those, which, like Mount Graylock in Massachusetts, consist partly of a very durable quartzite. Since their formation these mountains have been very much worn, and there is every indication that they were once very lofty ranges. Among them the folds are very often overturned, and there are numerous illustrations of overthrust faults where the rocks have broken along a nearly horizontal plane, and the upper beds have been moved bodily over the lower. Some of these faults are of great extent.

Toward the west the mountain folding disappeared; but how far it extended cannot be told, for later rocks cover the folded strata. It certainly extended as far west as Little Falls, for the folds on the southern margin of the Adirondacks are of this age.

During the remainder of the Silurian and Devonian times, the condition of that part of New York which lies outside of the Adirondacks and the two southeastern provinces of folded rocks, lay beneath the sea, at least for the greater part of the time. This sea was on the average a shallow one, and it received contributions of sediment from the Adirondacks, the Taconic ranges, and also probably from the Canadian highlands. Shallow water conditions are almost everywhere indicated among these central New York strata, and the very coarseness of the deposits among the Catskills shows that land was near by at the time these were deposited. During these geological periods, there was deposited in this sea a depth of sediment which in the Catskills is fully 10,000 feet, in central New York, in the Genessee River valley, not less than 7,000 feet, and in the highlands of Chautauqua County, some 6,000–6,500 feet.* During this time, the straits that had connected the inland sea with the ocean north of the Adirondacks became filled and closed. The beginning of the St. Lawrence valley along the northern border of New York had been determined very early by a depression into which the sea entered.

While the Silurian and Devonian sediments were being laid down, there were evidently numerous minute changes in the land and water; but the average condition was one of slow subsidence of the general area which was beneath the sea. Beds of shale and limestone were being deposited over much of the State, although sandstones and conglomerates were formed in some places near shore lines. During the Salina of the Upper Silurian, conditions prevailed over central New York as a result of which extensive beds of rock salt were accumulated between the beds of shale, the total depth of the salt strata often being from 50 to 150 feet.† The reason for these salt beds is apparently a shallowing of the New York sea accompanying a broad general uplift in Ohio, and neighboring States, which has been called the Cincinnati arch. Before this the conditions had favored the deposit of the thick Niagara limestone in clear and perhaps moderately deep water. By the shallowing of the sea this part of the State may have become a great salt vat, reached by the sea and subjected to evaporation so that beds of salt were precipitated and later covered by beds of very fine mud. After this the sea again entered this portion of the State, becoming clear open water, perhaps of considerable depth, and certainly free from land sediment. During this time another series of limestone-beds, the Helderberg and Corniferous, which extend from near the Hudson to Buffalo, were accumulated in the sea.

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*Communicated by Prof. C. S. Prosser. For records of sections in New York, see Prosser, Proc. Am. Assoc. Adv. Sci. XXXVI, 1887, 208–9; Am. Geol. VI, 1890, 199–211; Proc. Rochester Acad. Sci. II, 1892, 49–104; Bull. Geol. Soc. Am. IV, 1893, 91–118. Fairchild, Proc. Rochester Acad. Sci. I, 1891, 182–186; 215–223.

†Eaton, Am. Journ. Sci. VI, 1823, 242–243; Smith, Am. Journ. Sci. XV, 1829, 6–12; Phil. Mag. VII, 1830, 198–201; Vanuxem, Geology of New York, Part III, 1842; Hall, same, Part IV, 1843; Gibson, Am. Journ. Sci. V, 1873, 362–369; Newberry, Trans. New York Acad. Sci. IV, 1887, 55–57; Wright, Science, VIII, 1886, 52; Newberry, Trans. New York Acad. Sci. IX, 1889, 39–45; Hall, Luther and Clark, Report 47, New York State Museum, 1894, 203–383.

After this, throughout the Devonian, the conditions favored the deposit of extensive beds of shale, which in central New York often reached more than 3,000 feet in depth. These vary from fine textured clay rocks to sand layers, and from real clay to impure limestone and even to pure beds of limestone, a few of which occur in the series. In the east, along the line of the Taconic, the deposits in this sea were mainly sandstones and conglomerates, evidently because this was near the coast line. Here, in the region of the Catskills, the sandstones are between three and four thousand feet thick, and this is the main determining factor for the existence of the Catskill Mountains. Their location therefore depends primarily upon the existence of a shore line supplied with quantities of sand and pebbles. In some places these Catskill beds are conglomerates.

Conglomerates are also found in the extreme southwestern part of the State, these being remnants of a bed of upper Devonian conglomerate. They have attracted considerable attention because of their supposed resemblance to ruined cities, which has given the name "rock cities"* to these conglomerate rocks which have broken along the joint planes and then tumbled apart as a series of huge blocks. These have been undermined by the action of denudation which eats away the softer underlying shales and allows these huge blocks to assume various attitudes. It is probable that this layer has recently extended over a considerable part of the high southwestern plateau; and perhaps it has been the cause for the great height of this section, the overlying conglomerate cap protecting the soft shales from rapid denudation.

Whether the Carboniferous ever extended into New York State or not; and, if it did, how far it extended, are questions now impossible to answer; but there seems little reason to doubt that the Carboniferous rocks did extend for at least some distance into the State. Since the Carboniferous time, throughout the entire State, there has been an almost uninterrupted condition of land exposed to the air; and during this time much rock material must have been removed. Throughout the higher parts of the central plateau the rocks are of the upper Devonian age; and, unless some Carboniferous strata existed there, having since been removed, we must marvel at the minute amount of work done by denudation throughout all of the post-Palæozoic time. Therefore the fairest supposition is that the Carboniferous did extend well into New York, perhaps covering the entire plateau.

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* Hall, Geology of New York, Part IV, 1843, 284–285. Ashburner Penn. Geol. Survey, Report R., 1880, 49–78.

Final Uplift.—Perhaps early in the Carboniferous time, certainly before the close of that period, the entire State of New York was raised above the sea, a position which, so far as we know, it has since uninterruptedly maintained, excepting perhaps in some very limited localities and for a short time, as for instance along the Champlain * and Hudson River depression. This elevation was associated with the uplifting of the Appalachian Mountains; and although within the State of New York there was no excessive mountain folding at this time, the great area of rocks forming the State were raised as a general plateau uplift with some minor folds. The rocks of the plateau itself, and of the Lake Plains to the north of it, are so upraised as to dip very gradually to the south. Near the central part of the plateau, along the shores of Lake Cayuga, and elsewhere within the State, the strata were thrown into gentle undulations with east and west axes. Near the boundary of New York and Pennsylvania, east and southeast of Binghamton, the effect of the plateau folding is plainly seen in the rocks; and at the angle of junction of New York, Pennsylvania and New Jersey, the mountain folds are quite pronounced. Among the Catskills, while there is some folding, the real cause for the ruggedness of the mountains is the presence of the very massive and durable sandstone, which in some places has a depth of not less than 3,000 feet. Because the upper Devonian in this part of the State is sandstone rather than shale or sandy shale, the Catskill region rises in a series of prominent elevations which are carved into very mountainous outlines. There has also been greater uplift in this section and some folding; but denudation is the really potent cause for the carving of these mountains.

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* Emmons, Geol. of New York, Part II, 1842, 127–134; 283–284; Kellogg, Science, XIX, 1892, 341.

There are no means of telling in what form the uplift of the State left the surface. However, from the dip of the rocks it seems probable that the greatest elevations were in the north and east. The Adirondacks seem to have continued, as they had previously been, as a great central divide, from which, as from a highland, the streams radiated out in all directions. The Taconic ranges must have served to prevent the flow of New York waters toward the east, just as they do at present. The greater uplift of the Catskill area may have determined some of the drainage approximately along the course of the Hudson valley, while in the trough between the Catskills and the Adirondacks, the Mohawk naturally developed. If the St. Lawrence valley in its present line existed early in the history of the State, there must have been drainage toward it, and there is very little reason to doubt that some of the water of the State thus found its way northward.

However, the tilting of the rocks to the south must have determined this as a direction to be pursued by much of the drainage. Before we can be certain of what has happened to the rivers of the State we must first learn more about the early history of the streams in the Pennsylvania region. What has led the Delaware and Susquehanna waters across the Appalachians through their remarkable water-gaps? Was the tilting of the rocks beneath the plateau of central New York accomplished at the same time as the uplift of the Appalachians, or has it been a later development? If the former, then the greater part of the drainage of the western half of the State must have been toward the south; if the latter, this does not of necessity follow. It seems that the topography and drainage indicate the first rather than the second. North-flowing streams have an advantage in cutting their valleys in rocks that dip to the south.* By the law of monoclinal shifting,† as the country wears down, the divides should gradually retreat to the south; and so the north-flowing streams would constantly gain territory at the expense of those which were flowing toward the south. As a matter of fact, the north-flowing streams of New York have not pushed their headwaters very far back into the plateau, apparently not so far as they would have done if they had been north-flowing streams at the beginning of the uplift of the plateau.

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* Of course this applies to any streams heading in a tilted region and flowing in opposite directions.

† This is, briefly, that in the settling of the surface of a country under the action of denudation, if the rocks are inclined, the divides will migrate in the direction of the dip. See Gilbert, Geology of the Henry Mountains, Washington, 1880, pp. 129 and 134; also Tarr, Elementary Physical Geography, p. 274.

Another question is whether the country was also raised to its present height. Here again the answer must be somewhat doubtful but apparently in the negative. Had it originally been elevated to its present height, it should be denuded vastly more than it has been. Even granting a complete covering of Carboniferous rocks for the central plateau, the time that has elapsed since the close of the Carboniferous would have allowed more than 10,000 or 15,000 feet of strata to be removed. Besides this, the drainage systems indicate later elevation, as do other facts from outside of the State.*

The history seems to have been that of an uplift at the close of the Carboniferous, continued now and then, so that considerable denudation has in the meantime been possible; and then, in the mid-Tertiary, there came a decided uplift which allowed all the rivers of central New York to cut deep valleys, and which occurred long enough ago to admit of sufficient broadening of the valleys to produce a mature type of topography. With this uplift something like the present condition of drainage was introduced, although in the details many changes have been introduced by the ice invasion.

Post-Palæozoic Denudation.—As a result of this extensive denudation, any rocks that overlaid the Devonian have been removed; and, in a great part of the area, the Devonian and older strata are trenched deeply by valleys, so that the plateau is very much dissected by deeply-cut valleys, particularly near the divides. Although these are fairly well rounded, there remain great hilly masses between, and so only a mere beginning has been made toward the removal of the Devonian and older rocks.

In the progress of the denudation there has naturally resulted an attack upon the plateau, not only by the streams that have trenched it, but also by wasting away from the north. If, as seems evident, there existed parallel to Lake Ontario a river with an east and west extension, from this valley as a base there would naturally be an attack upon the rocks of the plateau which lies to the south. The strata of this plateau, dipping toward the south, exposed their outcrop edges towards the north. The hard rocks protected the soft; but, as these were undermined, the hard strata retreated in the direction of the dip, but always with a tendency to maintain an elevated position. An excellent example of this is seen between Rochester and Lewiston, especially near the latter place, where the hard Niagara limestone is covering soft shales and determining the position of the bold Niagara escarpment. Where the hard Helderberg limestone outcrops, the same tendency exists, and here again an escarpment results. This very marked influence of the rock structure on topography, producing so precipitous a slope in a region whose elevation is not great, could only result when the action of denudation had produced moderate effects during its present cycle.

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* Notably the fossil faunas of Mesozoic and early Tertiary ages, which seem to prove the existence of lowlands in the north-eastern part of the country. Also in the valley of Lake Champlain, deposits of Tertiary age prove a depression for this region.

The time is not yet ripe for the announcement of the complex histories of New York rivers, and hence for the elucidation of the development of many of the main topographic features of the State. The remarks made above are merely suggestive and are thrown out only as hints. However, it seems very certain that rivers with different kinds of valleys, and perhaps even with different courses, existed before the Tertiary uplift. Then the streams cut down through the rocks and carved their mature valley forms, perhaps not always in the courses which they formerly pursued.

Ice Invasion.—Then, as a last step in the development of the features of the State, came the Glacial Period, which came later than the Tertiary uplift, and during which practically the entire State of New York was covered with a thick sheet of ice. Why this came, how long it remained and why and when it disappeared are questions that do not now admit of definite answer. For some reason, possibly the elevation, from some source in northeastern Canada, an ice sheet spread out over New York, covering it as effectually as Greenland is covered by ice to-day. When this went away the surface of the land, though in many particulars hardly affected, was nevertheless in many respects strangely transformed. Over the surface was strewn a sheet of glacial deposit of variable thickness;* some of the hills were planed down and rounded, others were built up; some valleys were deepened, others were more or less completely filled; some streams were turned completely out of their valleys, some partly so interfered with, and many were locally transformed to lakes. The hundreds of lakes that dot the State were thus created, and even Lakes Erie and Ontario had their birth at the close of the ice period. The Falls of Niagara, and many other gorges and waterfalls, have also had their beginning as a result of the ice action. With the withdrawal of the glacier, the form of the lakes varied, finally assuming their present condition. The sea also rose higher than it does at present, and parts of the Hudson-Champlain depression were submerged; and then, finally, the conditions of the present came about. Many of the details of the physiography of the State are a result of this ice invasion, and some of these subjects will serve as special topics for discussion.

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* Mather, Geology of New York, Part I, 1843, 158–228; Hall, same, Part IV, 1843, 318–341. Chamberlin, Third Annl. Rept. U. S. Geol. Survey, 1883, 347–379.

CLIMATE OF THE STATE.*

Throughout the State of New York there is abundant though not excessive rainfall; but, as in the other eastern States, there is liability of occasional drought. The total precipitation in inches varies from 25–30 in the northwestern part of Niagara County, and in some places north and east of the Adirondacks, to 60 inches near the coast and on the slopes of the Adirondacks. The rainfall probably amounts to more than this on the tops of these mountains. Over the greater part of the State the rainfall ranges from 35 to 50 inches. There is a greater percentage of cloudiness near the Lakes than at a distance from them, and over nearly one-half of the State the sun is obscured for more than 60 per cent. of the time during which it is above the horizon. In the southeastern portion of the State there is the least cloudiness.

The mean annual temperature ranges from 50° near the coast and 48° near Lake Erie, to less than 40° in the Adirondacks. The mean temperature for July ranges between 72° on the coast and 70° near Lake Erie, to less than 64° in the high Adirondacks. In January it ranges between 30° at the coast and 26° on the Lake Erie shore, to considerably less than 16° among the high Adirondacks.†

In the distribution of the isotherms there is much irregularity, for the influence of topography is very marked. It will be seen from this statement of temperatures that New York is peculiar in having high summer and low winter averages. However, it is not nearly so extreme as some of the interior States. For instance, St. Paul, Minnesota, has an average temperature of 72° in July and 8° in January; and St. Vincent, Minnesota, has an average of 65° in July and — 10° in January. On the other hand, San Francisco has a summer temperature of 69° and an average winter temperature of 50°, choosing single months for the averages.

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[*] There is an admirable discussion of this subject in the Fifth Annual Report of the State Weather Bureau of New York, Department of Agriculture, Albany, N. Y., 1894, pp. 345–448, written by Mr. E. L. Turner.

[†] For the upper portions of the Adirondacks there are no reliable data.

Since New York has such low winter and high summer temperatures, the climate of the two seasons corresponds with climates in widely differing latitudes. This has been so well stated by Mr. Turner* that I quote from his description as follows :

"The isothermal line of 70 degrees, which will be observed on the chart for July to pass from the Great Lakes over northern New York, extends thence eastward through New England to the vicinity of the coast, where it again turns toward the southwest, meeting the line of 70 degrees which appears over eastern Long Island. This isothermal then passes directly eastward over the Atlantic near parallel 40 degrees, intersecting the coast of Europe in northern Spain. Reaching the warmer land surface, it tends somewhat north of east through Central France, Austria, Central Russia and Siberia. Near the eastern coast of the latter country it turns southward through 20 degrees of latitude and passing to the Pacific over the Island of Japan, continues nearly eastward, meeting the coast of America in Central California. Thence it follows the meridian of 120 degrees west well northward into British America before again turning to the southeast in the direction of the Great Lakes and northern New York.

"The line indicating 74 degrees in July passes from New York directly southward over the ocean until opposite Virginia; thence slightly south of east to Morocco in North Africa, where it turns northward to France; thence passes through Southern Europe (north of the Italian peninsula) to the Black Sea, through Central Asia at latitude 50 degrees, and near the coast turns southward to Japan. Diverging somewhat from the isotherm of 70 degrees, in its course over the Pacific, it touches America in Southern California, follows the Rocky Mountains northward to British America and thence takes a southeasterly direction to the Great Lakes and New York.

"In January, New York is to be classed with quite different regions of the globe from those named above. The isotherm of 15 degrees, which appears near the northern boundary of the State, passes thence over Labrador, the southeastern coast of Greenland and the Arctic Ocean. When well to the northward of Scandinavia it turns southeastward through Central Russia (passing north of St. Petersburgh) to the northern border of the Caspian Sea. Proceeding eastward to Northern Japan and northeastward over the Pacific it reaches the southern coast of Alaska, when it again trends southward to South Dakota and finally passes north to the Lake Region to the St. Lawrence valley.

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* 5th Annual Report, New York State Weather Bureau, 1894, pp. 361–2.

"The mean January temperature of 30 degrees (that of New York City) is found also in southern Newfoundland, Iceland and northern Norway. This isotherm turns sharply southward in the latter region and passes to eastern Germany, Austria and the northern border of the Black Sea, when its course becomes eastward to the Pacific. Like all the preceding lines it intersects Japan and thence passes northeastward to the Aleutian Islands. Following the American coast line to the border of the United States it turns southeastward to Missouri and thence passes to the southern shore of the Great Lakes."

There are several interesting climatic peculiarities in the State of New York. In general, the climate is that of an interior land area, though it is near enough to the seashore to be somewhat influenced by the ocean. The prevailing winds are from the west* and the alternations of weather conditions are due to the passage of successive areas of high and low pressure from west to east, carrying with them alternate conditions of clear, dry weather and cloudy, rainy weather.

In these respects New York is not unlike the other States of the north. During the clear anticyclonic times of high pressure conditions, cool or cold winds blow over the State from the north and the northwest, in winter spreading a blanket of cold air over the land. While the stormy conditions of the low-pressure areas prevail, air is drawn over the State from the south. It then comes either from the Atlantic or the Gulf (the latter particularly in the western portion), and so brings moist, warm conditions to the State. With the coming of the south wind, rain and snow often fall because the air in moving northward passes into colder regions and also rises over the plateau, thus being cooled down to the dew point, when precipitation must follow. When rain does not fall, the weather becomes warmer, in winter producing thaws, in summer causing heated terms.

These normal conditions of weather change are somewhat interrupted by the topographic features of the State, only a few of which can be mentioned. Long Island and the vicinity of New York City is distinctly the region most under the influence of the ocean of any part of the State; hence the winters are warmer, and on the seashore the summer heat is more moderate. The mean annual temperature is higher and the range in temperature less than in other portions of the State. Also in this part of the State the rainfall is greater than in other portions, with the probable exception of the high Adirondacks. During the summer the heat of the land is frequently tempered by the cool sea breezes that blow in from over the ocean.

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* This is often well illustrated in orchards, where the trees are all seen to incline towards the east.

The coldest and most variable portion of the State is the high Adirondacks, which, though cool in summer, become very cold in winter. Here there is much snowfall and the climate is distinctly that of mountains.

An influence very much like that of the ocean is exerted upon the climate of New York by the waters of the Great Lakes. They serve to temper the summer heat and to moderate the winter cold. When a cold wave overspreads the region, the temperature of the United States side of Lake Ontario is often 10° or 20° higher than it is on the Canadian side. This influence of the Great Lakes holds back the spring-time development of plants by the presence of the cold water; and hence vegetation is not liable to suffer from late frosts as it is in more distant regions where this development has proceeded farther. In the fall the warm body of water, with its temperature raised through the summer, does not cool so quickly as the land; and hence by its presence the water prevents frosts near the lake shore and lengthens the growing season. Also, during both summer and winter the presence of the water serves to moderate the climate. Upon the shores of the lakes there are real lake and land breezes, just as there are sea and land breezes along the ocean shore.

The effect of the water of the Great Lakes is felt very nearly all over the State, for many of the winds must blow over their surface before reaching other parts of the State; but the really noticeable influence is confined to a distance of but a few miles from the shore. This influence becomes particularly noticeable where the lake shore plains are backed by an escarpment, which serves to keep the lake influence partly confined within a narrow space. This is shown very well indeed near Lewiston at the base of the Niagara escarpment, and also along the Erie shore in Chautauqua County.* In both of these places the climates are so favorable that they are the sites of extensive fruit raising. To a less extent this is true of the whole lake shore.

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* See Tarr, Bulletin 109, Cornell University Agricultural Experiment Station, "Geological History of Chautauqua County," Ithaca, N. Y., Jan., 1896. Also for other parts of the Lake shores, Winchell, Proc. Am. Assoc. Adv. Sci. XIX, 1870, 106–117; Kirtland, Am. Journ. Sci. XIII, 1852, 215–219; Hazen, Bull. 10, U. S. Weather Bureau, 1893. The last three are not for New York, but illustrate lake effects in other States.

In the Chautauqua region the difference is most remarkable. Upon ascending the escarpment the temperature becomes noticeably lower in a distance of a few miles. Very often rain falls upon the lake shore plains while snow is being precipitated on the hills; and frequently during the winter there is sleighing on the hill-tops, while no snow exists upon the lower plains upon which one looks down. With this difference in elevation there is also a difference in the *amount* of precipitation, and the rainfall upon the hills is perceptibly greater than that on the plains. This is frequently well illustrated during the summer when thunder showers are seen hanging over the crest of the escarpment, while no rain falls in the grape belt of the lake shore plain.

There is also a perceptible effect upon the climate in the neighborhood of the smaller lakes. This is illustrated in the valleys of the several larger Finger Lakes which occupy deep trenches in the plateau. In these the winds are deflected somewhat, so that nearly north or south directions of wind are the common ones. Also the valley sides are warmer than the enclosing highland, partly because they are enclosed, but partly because of the influence of the water. Even the small body of water in the lakes serves to modify the neighboring climate very perceptibly. Near the lake shores, both the nights and the days of summer are cooler than they are upon the neighboring hills, and the winter climate is perceptibly less severe. Here also there are important fruit districts because of this marked modification of the climate, which locally is rendered less extreme.

In the Mohawk and Hudson River valleys there is the same kind of influence upon the climate, and we find that the isotherms extend well up into these valleys. Here also the winds are deflected, in the Mohawk to a general east and west direction, and in the Hudson to north and south directions. So the relation between the physiographic features of the State and the details of climate and weather is very intimate. In this place, however, no more can be done than to point out the bare fact.

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THE ALASKAN BOUNDARY.

BY

MARCUS BAKER.

Three score and ten years ago the diplomatic agents of Russia and Great Britain met in St. Petersburg and proceeded to consider and adjust certain outstanding questions as to the respective rights of Russian and British subjects to hunt, fish, trade, navigate, and make settlements in the North Pacific. At the same time and as incidental thereto they agreed upon the sovereignty limits of their respective governments, and in terms defined a boundary line. This line, then and there described and accepted, constitutes the present eastern boundary of Alaska now attracting public attention. It is a line defined upon paper, but not upon the ground. It has never been surveyed or marked. Preparations for its survey and marking have been in progress for some years, and the time has now arrived for concluding preliminaries and agreeing upon some practicable mode of surveying and marking it.

But with the arrival of this time, lo! smoke, metaphorically speaking, in increasing volume appears along the line, drifting across and obscuring it. What for half a century had been clear and plain is now darkened, and through this smoke we discover here and there not the old familiar line with which we and our fathers before us were familiar, but a new and strange line farther west and south, and we see that Alaska has shrunken and British Columbia grown. At this our cheeks flush. Our faith in the friendliness and goodwill of a neighbor who would hint at, much less contend for such a change, is rudely shaken. Suspicion replaces frankness. For amicable arbitration of honest differences, bitter and costly litigation is foreshadowed, and long enduring resentment.

I purpose to set forth as clearly and fairly as I can within the compass of a magazine article, a plain statement of the Alaskan boundary question. And, in so speaking, I speak for myself alone; I speak in no official capacity, and with no other than public knowledge. The facts used are not drawn from the secret archives of any public or private office, but are public property, accessible to any one who will take the trouble to collect and arrange them.

Seldom is an international boundary line drawn into controversy without arousing a sentimental as well as a geographic interest.

And although prediction, as Senator Hoar has well said, "is not yet an exact science," I venture to predict that a very lively interest in, and spread of knowledge concerning Alaska is imminent, aroused and sustained by its boundary question. For, have we not among us the spirit of the Boston tea drinkers who declined the British tea accompanied by its odious tax? Not its *heavy* tax, mark you, but its odious because unjust tax.

All boundary questions are, from their very nature, geographic in character, and no purely geographic matter or question of the slightest complexity can be clearly stated, explained, or understood without maps. If you would know where a boundary is, or what it is, draw it on a map. By so doing its bearings and relations become clear at once. But I believe the lawyers and diplomatists do not make use of such graphic aid. It would be unprecedented. Words, only words, are relied upon to make clear what even a rude diagram would make clearer. But to introduce maps into a treaty defining a boundary, or into a statute, or into a deed of conveyance would be an innovation and an improvement, two things which the law resists with the force of a mighty inertia.

Let us then turn to the maps. For the proper and easy understanding of this matter about a dozen large, selected, typical maps which have been published by Russia, Great Britain, Canada, and the United States in the last 100 years are needful.* But it is impracticable to reproduce them here, and we must content ourselves with a few small maps and diagrams.

First, we have a map of Alaska and the adjoining region (Plate I), which shows the general situation of Alaska, and its relations to Canada and Siberia. The boundary line here shown is the familiar one appearing on all maps from 1825 to 1884, when a rather surprising and startling change was made in the line near its south end, of which we shall speak later.

Second, we have the southeastern strip of mainland and adjacent islands (Plate II), which may for convenience be called the Pan-

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* The student who may wish to prosecute the study more fully will find the following maps instructive :

Stanford's Library Map of North America. London, 1886.

U. S. Coast and Geodetic Survey charts T, 8001 and 8050.

Maps in Senate Ex. Doc. No. 146, 50th Cong. 2d sess. Washington, 1889.

Vancouver's atlas. London, 1798.

Maps in Cook's voyage. London, 1784.

Map published by the St. Petersburg Academy of Sciences about 1750, showing the earliest Russian Discoveries in America. Various editions of this map have been published.

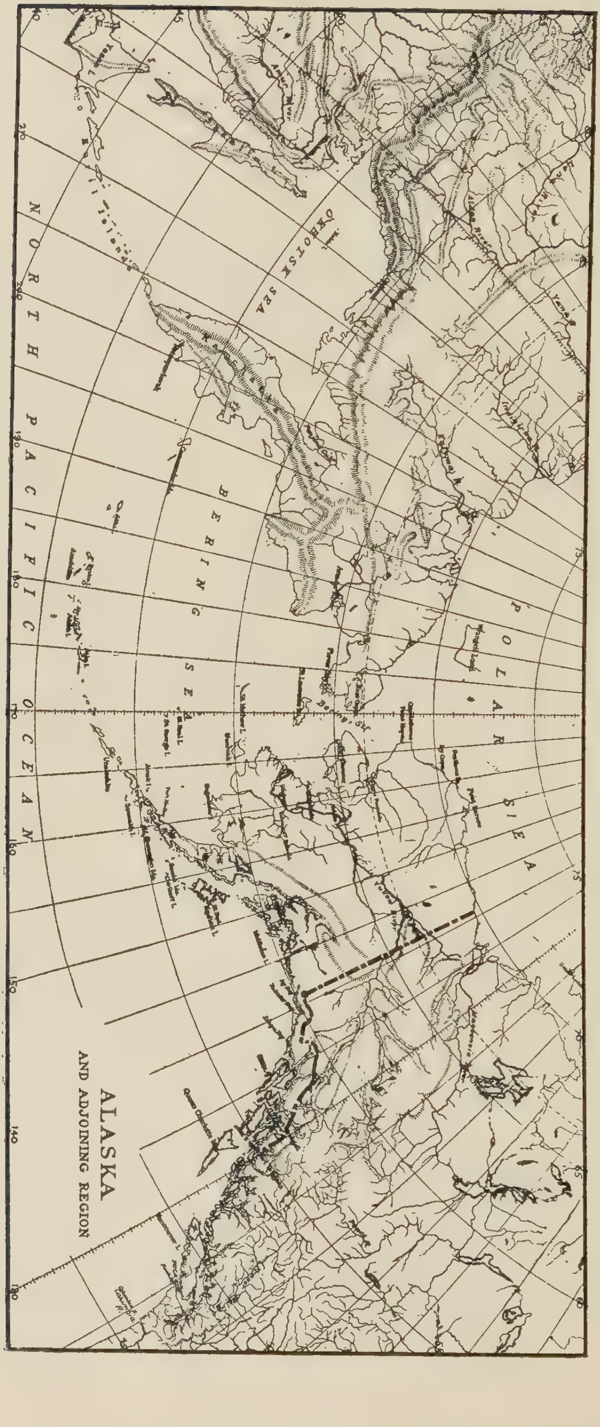
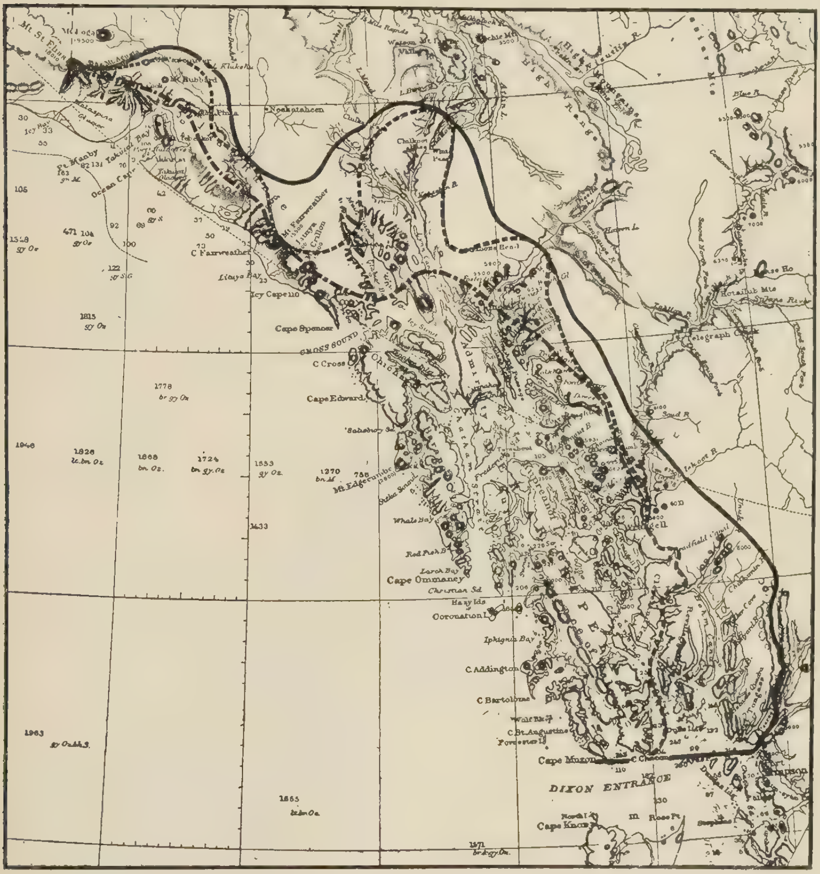

ALASKA
AND ADJOINING REGION
NORTH PACIFIC OCEAN
BERING SEA
OKHOTSK SEA
POLAR SEA
Bering St.

PLATE I.

handle. This is the region where in recent years changes in boundary lines have appeared, changes which increase Canadian and diminish Alaskan territory.

PLATE II.



SOUTHEASTERN ALASKA FROM RECENT COAST SURVEY CHART.

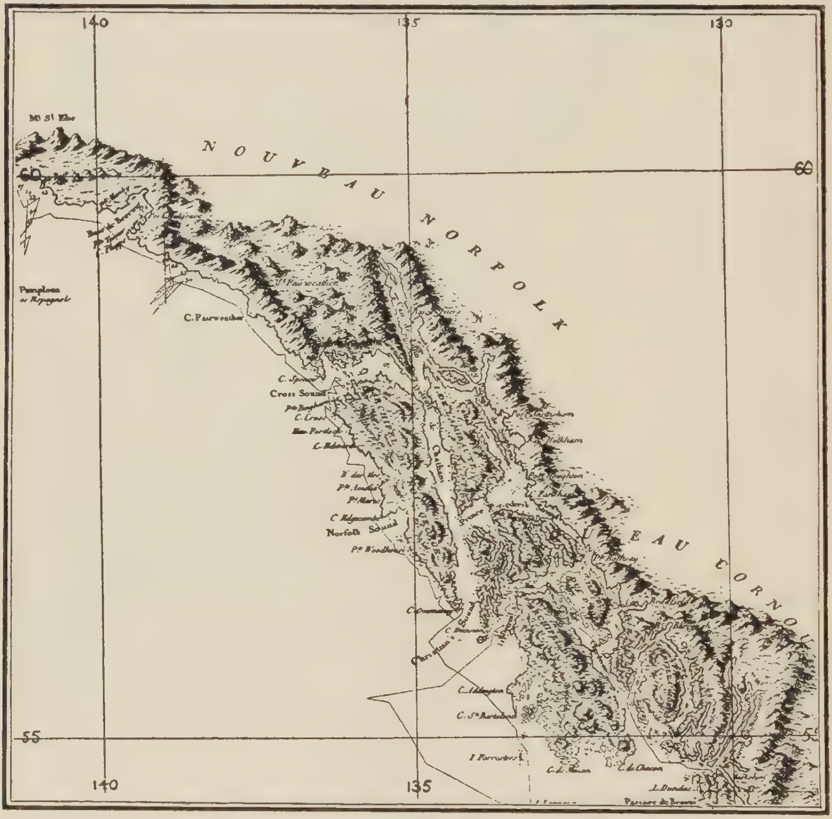
——— Boundary Line shown on U. S. Coast Survey Maps.
- - - - “ “ “ “ Canadian Map, 1884.
– · – · “ “ “ “ “ “ 1887.

The map is taken from one recently issued by the Coast Survey, except as to the boundary lines. The *first* or full black line is the one usually shown as the boundary. It, or one substantially like it, is the only one shown, so far as I am aware, that was used from the beginning, in 1825, down to 1884. The *second* line (dotted) appeared on a Canadian map of 1884. In its northern part it agrees approximately with the usual line, but at the south end it is moved westward some 60 miles from Portland Canal to Clarence

Strait and Behm Canal. The *third* line (broken) appeared on another Canadian map in 1887. On this map the line of 1884 was in the northern part moved over so that instead of going around the heads of the inlets and fiords it crossed them leaving their heads on the Canadian side.

Third, we have (Plate III) a photographic reproduction of the French edition of Vancouver's map of the Panhandle. This is the map which was doubtless used by the diplomatists of 1825 when they framed their description of the boundary line.

PLATE III.



SOUTHEASTERN ALASKA FROM VANCOUVER'S ATLAS, 1798.

The Panhandle is seen to consist of a strip of rugged coast deeply indented by fiords. On or near this strip are the highest of North American mountains. Glaciers of great size and beauty abound and discharge their milky waters and ice masses into nearly every one of the numerous and profoundly deep fiords. In front of and guard-ing the southern half of this strip is a great group of some 1100 islands. In honor of the Russian Tsar this archipelago received from the U. S. Coast Survey in 1867 the name of Alexander. It is mountainous, timbered, sparsely settled, and picturesque. Its total area, according to our best knowledge, is 14,200 square miles. The area of the strip of mainland comprised in the Panhandle is 34,350 square miles. Thus the area of the Panhandle, including the adjacent islands, is 48,550 square miles, or about that of New York State. The boundary line is either "the summit of the mountains situated parallel to the coast," or if these summits are more than 10 marine leagues (about 35 miles) from the coast, then the boundary is 35 miles from the coast and parallel to its winding. It is obvious, therefore, that surveys and geographic studies are needful to trace the "winding of the coast," and to learn more definitely about the summit of the mountains. Such surveys have been in progress for several years by surveyors of Canada and the United States. For surveys in the Panhandle, to secure information needful for determining the boundary, Congress has appropriated $50,000. It is an open question of fact as to where the line is, because it is *either* the "summit of the mountains parallel to the coast," *or* a line "parallel to the winding of the coast." This uncertainty is due to the imperfect geographic knowledge existing when the line was agreed upon. Better knowledge being now available, the alternative clause is to be resolved. As a matter of fact, it is to be determined:—Does the range of mountains contemplated by the treaty exist? If it does, then is it anywhere more than 35 miles from the coast? If it does not exist, or is everywhere or anywhere more than 35 miles from the coast, then it is to be determined what constitutes a line parallel to the winding of a very irregular coast line.

After this general introduction I now proceed to a more particular examination of the treaty of conveyance by which the United States acquired from Russia 28 years ago this large northern tract which before 1867 was nameless. The Russians spoke of their possessions in America, and we used the descriptive phrase, *Russian America*. After the sale, however, the descriptive phrase was no longer applicable. Accordingly, it was formally named Alaska.

If one would fully understand an ancient document he must do more than merely read it. It must be studied. Nay more, the conditions preceding and accompanying its production must be examined and understood. The lawyers tell us that if a statute is to be properly construed, there must be considered, *first*, the old law, *i. e.*, the law which existed when the statute under examination was enacted; *second*, the mischief which the statute was designed to remove, and *third*, the remedy provided by it. This wise outgrowth of experience will apply with great nicety to the interpretation of treaties. Would that I could carry the reader back to the time and circumstances under which, seventy years ago, the Rt. Hon. Stratford Canning, for England, and the Count de Nesselrode and Pierre de Poletica, for Russia, engaged in a little diplomatic conference, of which Alaska's eastern boundary was one of the results. Little cared they for a few leagues of barren coast. Greater interests were at stake, and now the minor part, Alaska's boundary, for the first time comes forward as the essential matter.

Let us briefly consider the development of the world's knowledge of Alaska, tracing it from the time when, by Bering's discovery in 1741, its first dim outlines began to appear, down to 1825, when the present boundary line was created. We may thus put ourselves in the place of the diplomatists and the people they represented, and be thus the better prepared to understand what they meant by noting carefully what they said and what they omitted to say.

Early in the last century the world did not know whether Asia and North America were united or separated. Certain vague rumors, scarcely traceable to any authentic source, affirmed their separation. Peter, greatest of Russian monarchs, the great Tsar Peter, ill content with this vagueness, determined to dissipate the prevailing ignorance on the subject, and ordered the organization and despatch of a party to find out. Thus originated the first expedition of Bering in 1725. I need not follow the details of the weary walk of two and a half years across Siberia (the North Land) to Okhotsk, the building of two vessels there, and the voyage in them around Kamchatka, to and through the strait that now bears the name of Bering. The report of this voyage carried, not sent, back to St. Petersburg aroused, as usual in such cases, more curiosity than it allayed, and Bering returns for his second and memorable voyage of 1741.

Two little vessels, with pious zeal christened the *St. Peter* and *St. Paul*, were in 1739 built in Okhotsk, and in the spring of 1741 were at Avatcha Bay in Kamchatka, ready for the voyage of discovery to the eastward. In a little harbor in the bay stands the present capital of Kamchatka, named after Bering's vessels, Petropavlovsk. Early in June, 1741, the little vessels, overcrowded with men, ill provided with supplies and equipment, sailed away to the eastward. The usual story of storm and scurvy and Indian massacre follows. When sixteen days out a storm separated the ships, never to be reunited. July 15, Chirikof sighted land somewhere in what is now Southeastern Alaska, and three days later Bering similarly saw the land and landed somewhere near Kayak Island. Then began the return voyage through those unknown and dangerous regions, which even with our present knowledge are dangerous ground. In August a landing was made upon an island to bury the first sailor who died during the voyage, Shumagin by name, and the name of that group of islands commemorates this fact. Storm-tossed, uncertain of their whereabouts, worn with anxiety, reduced in number by scurvy and bad water, they welcomed the sight of the land where on November 6 they went ashore and decided to winter. A few days later a winter gale drove the *St. Peter* ashore, and in December, Bering, worn out with his labors, care and exposure, died and was buried on the island which has since borne his name. The tidings of this voyage carried back to St. Petersburg sustained and stimulated interest in these geographic matters. About 1750 the Academy of St. Petersburg published a map embodying the geographic results. This was the first map, not purely fanciful, to be made of this region. It was extensively copied, and for about forty years remained the best existing map of that region.

The next great stride in our knowledge of the "lay of the land" we owe to that redoubtable Englishman, Captain Cook, who, while we were in the midst of that memorable seven years' war waged in defence of our inherited and denied English liberties, was engaged in exploration in the Pacific Ocean. To the two great English navigators, Cook and Vancouver, we are indebted for a larger share of our geographic knowledge of the Alaskan region than to any other two men. Cook, in the summer of 1778, outlined in its main features the Alaskan coast from its southernmost point to Icy Cape. The comparison of Cook's map with the St. Petersburg map will interest and instruct any reader who has the good fortune to be able to compare them.

The publication of Cook's voyage revived, I had almost said violently revived, interest in a Northwest Passage. Commerce with China and the East was exceedingly profitable, and accordingly the search for a short cut to the Indies was long pursued and ardently hoped for. Hudson Bay admitted shipping far into the interior of North America. Was there not another Hudson Bay penetrating the opposite coast? Great Britain, ever alive to commercial advantage, felt that Cook's report warranted a further and more minute search. And hence it is that, before Washington was half through his first term, we see the incomparable Vancouver, commanding two ships, the *Discovery* and *Chatham*, outward bound on that memorable voyage of geographic research and diplomatic negotiation. For even then Great Britain had a boundary matter on hand, in this case with Spain. In the three summers of 1792, 1793 and 1794 he traced out and mapped the coast line of Western North America so fully, so carefully, and so accurately that, though a century has since elapsed, his maps remain of certain parts the best there are to this day. No one can fully appreciate or interpret the language of the treaty defining the boundary line without reading it with Vancouver's maps before him, as it doubtless was before the framers of the treaty as they wrote.

The description of the boundary line we are considering was first drawn up in 1825 in a convention between Russia and Great Britain. Between the publication of Vancouver's maps in 1798 and the convention of 1825, some advance in knowledge of the region had been made. Such advance was chiefly in details, little patches of filling in, here and there, and therefore we may be aided in understanding what the diplomatists knew about the region they were dividing by recording a few facts of which they were ignorant.

Already McKenzie had descended the river which bears his name to its Arctic mouth, but between that point and Icy Cape the map was a blank. Whether Alaska and Greenland were united or separated no man knew. All Alaska's interior was a blank on the map. On the Bering Sea coast the researches of Russian naval officers, from 1818 to 1823, had yielded an approximate indication of the coast line left blank by Cook, and had revealed the delta of a mighty river, the Kwikpak or Big river of the Eskimo. Little was known of this river beyond its mouth. That it was identical with the Yukon was unknown till long afterwards. For some years the Yukon is shown as draining into the Arctic Ocean near Point Barrow. At the date of the convention not even this piece of misinformation had got on to the maps. The Russian post at Nulato was not founded till 13 years later, and the English Fort Yukon not till 21 years later. St. Michael Redoubt of the Russians was still in the future. Sitka, however, or New Archangel, as the Russians called it, had been in existence for a quarter of a century, and was the thriving seat of a flourishing fur trade in the Alexander Archipelago.

With such geographic information, or perhaps I should say with such want of it, it was that the Rt. Hon. Stratford Canning for England and the Count de Nesselrode and Pierre de Poletica for Russia met in St. Petersburg in 1825, to adjust, by diplomatic methods, certain outstanding differences between their respective governments.

I have now dwelt somewhat at length on the development and condition of the geographic knowledge existing when the diplomatists entered upon their conference. For clearly understanding the case it remains to add a brief statement as to the diplomatic situation.

That the high seas belong to no man or nation is an axiom. At least it seems so now. It is interesting therefore to recall that within the memory of men now living the Russian Tsar issued a proclamation, or ukaz as it is called, declaring that all the coast of the North Pacific Ocean and Bering Sea, from northern Japan on the Asiatic coast to southernmost Alaska on the American coast, was Russian territory, and warning all foreign vessels not to approach those coasts within 100 miles, except by reason of distress.

This ukaz was issued in 1821. Cruisers were sent out to enforce it. The brig *Pearl* of Boston was seized. Against this the United States protested. Great Britain also entered her protest. To a liberty loving people such an assumption was intolerable, and it, of course, promptly became a subject of international conference. The first outcome was a convention, three years later, in 1824, between Russia and the United States, by which Russia receded from her position and agreed that the North Pacific should be open to citizens of both nations for fishing, trading, and navigation. Russia agreed to make no settlements south of the famous parallel of 54° 40′, and the United States agreed to make none north of it. Great Britain sought, and the following year obtained, similar concessions. And at the same time, and by the same convention, the present southern and eastern boundary of Alaska was agreed upon. The leading feature of this conference was to obtain for Great Britain the same concessions which Russia had, the year before, made to the United States as to free navigation, fishing and trading in the North Pacific. In the preamble to this convention it is recited that the King and the Tsar, "being desirous of drawing still closer the ties of good understanding and friendship which unite them, by means of an agreement which may settle, upon a basis of reciprocal convenience different points connected with the commerce, navigation, and fisheries of their subjects on the Pacific Ocean, as well as the limits of their respective possessions on the Northwest coast of America, have named plenipotentiaries," etc. The retraction by Russia of her claim to exclusive jurisdiction in the North Pacific was the main point. Incidentally a boundary line was to be agreed upon, a boundary line passing through a region that with one trifling exception had never been visited by a white man and for all the rest was as much a *terra incognita* as the South Polar region is to-day. To establish such a boundary was the incidental and not the principal object of the convention.

After this rather long though condensed historical introduction, we may now consider the very words used in the convention, reading them in the light of the historic facts and of Vancouver's maps, which, being not only the best, but almost the only maps then available for the purpose, were the ones used by the diplomatists.

The following is an extract from the Treaty by which Russia ceded Alaska to the United States in 1867:

ARTICLE I.

His Majesty the Emperor of all the Russias agrees to cede to the United States, by this convention, immediately upon the exchange of the ratifications thereof, all the territory and dominion now possessed by his said Majesty on the continent of America and in the adjacent islands, the same being contained within the geographical limits herein set forth, to wit: The eastern limit is the line of demarcation between the Russian and the British possessions in North America, as established by the convention between Russia and Great Britain, of February 28–16, 1825, and described in Articles III and IV of said convention, in the following terms:

"Commencing from the southernmost point of the island called Prince of Wales Island, which point lies in the parallel of 54 degrees 40 minutes north latitude, and between the 131st and the 133d degree of west longitude (meridian of Greenwich), the said line shall ascend to the north along the channel called Portland Channel, as far as the point of the continent where it strikes the 56th degree of north latitude; from this last-mentioned point, the line of demarcation shall follow the summit of the mountains situated parallel to the coast, as far as the point of intersection of the 141st degree of west longitude (of the same meridian); and finally, from the said point of intersection, the said meridian line of the 141st degree, in its prolongation as far as the Frozen Ocean.

"IV. With reference to the line of demarcation laid down in the preceding article, it is understood—

"1st. That the island called Prince of Wales Island shall belong wholly to Russia" (now, by this cession, to the United States).

"2d. That whenever the summit of the mountains which extend in a direction parallel to the coast from the 56th degree of north latitude to the point of intersection of the 141st degree of west longitude shall prove to be at the distance of more than ten marine leagues from the ocean, the limit between the British possessions and the line of coast which is to belong to Russia as above mentioned (that is to say. the limit to the possessions ceded by this convention), shall be formed by a line parallel to the winding of the coast, and which shall never exceed the distance of ten marine leagues therefrom."

In studying the foregoing, attention should be constantly given to Vancouver's maps, of which one is here reproduced (Plate III), taken from the French edition, that being the edition which is supposed to have been used. The treaty is in two languages, French and English, both being signed. Thus, one is not a translation of the other. Both are originals, and they may rather be called two versions and each may help to interpret the other.

The boundary line is to start "from the southernmost point of Prince of Wales Island in latitude 54° 40′." Now, curiously enough, there was no Prince of Wales *island* in this region when the treaty was drawn up. Vancouver had named a large group of islands Prince of Wales *archipelago*, of which the largest island is now called Prince of Wales Island. It is obvious, from an inspection of the map, that no one then knew which was the southernmost point of Prince of Wales Archipelago, Cape Muzon or Cape Chacon. Hence was used "*the southernmost*" as a phrase which would apply to that one which should thereafter be found to fulfil this condition. We now know that the southernmost point is Cape Muzon, and that it is not on Prince of Wales Island at all, but on Dall Island. The line is therefore to start from Cape Muzon. What is its latitude? The diplomatists recognizing the fact that better knowledge might show that this point was not in latitude 54° 40′, provided, in the next clause, that whatever its latitude should thereafter prove to be, in any event the island (which should be archipelago) should belong to Russia (and now to the United States).

The parallel of 54° 40′ passes through Dixon Entrance, the only great break in the island barrier fronting the coast of western North America between Puget Sound on the south and its counterpart, Lynn Canal, on the north. This parallel was already a boundary line agreed upon by Russia and the United States in 1824. It was most natural, therefore, to start with this same parallel the following year when Great Britain and Russia were considering precisely the same matters. After starting from this southernmost point the line is to ascend to the northward along Portland Canal until it strikes the 56th degree of north latitude. Whether *it* refers to the boundary line or Portland Canal has been made a question. A peculiarly forced construction is needed to make it apply to the canal, which does not reach the 56th degree, and is clearly shown on Vancouver's map to terminate some miles south of that parallel. The line on reaching the 56th degree of north latitude is to follow the summit of the mountains parallel to the coast until it encounters the 141st meridian of west longitude. The diplomatists recognizing the imperfect character of the information upon which they were compelled to rely added an alternative clause, to the effect that, if these mountains of Vancouver's map were farther inland than shown, then the boundary should be a line not more than 10 marine leagues (about 35 miles) from the coast and parallel to its winding.

We now know what the diplomatists did not know about that range of mountains which they saw on the maps before them, assumed to exist in fact, and selected for an international boundary line. It does not exist. No such clearly-defined crest line as Vancouver shows is to be found on the ground. I am not unmindful of the fact that this statement may be denied and elaborately argued. It is beside my present purpose to argue this point, and I therefore dismiss it with this bald statement. The alternative proposition of a line parallel to the coast is therefore to be adopted. In its application the question of coast line from which to measure will assume importance.

The coast line is the one which Vancouver and his recent followers in the Coast Survey have so fully traced out. It is the high-water mark of the briny deep. Vancouver's chief concern was to minutely trace out the continental outline. In this work he patiently followed to their heads the numerous long and deep fiords which indent the coast, and he so followed them because in no other way was it possible to tell whether the land bordering them was part of the continent or of an island near the continent. The waters are salt and very deep, the rise and fall of tide conspicuous, the tidal currents strong. In such a configuration of coast line there can be no question from the standpoint of a geographer or hydrographer as to where the coast line is. It is the high-water mark of tide water. This definition carries the coast line to the heads of the various inlets, canals, and fiords making up this intricate coast line to which the boundary line is to be parallel. It will be a matter for the commission, charged with the duty of settling this boundary matter, to interpret the phrase *parallel to the winding of the coast.* To determine the *intent* of the parties ought not to be difficult, but there is a rich field here for fine-spun casuistry, international law, and sentiment. The boundary line between Massachusetts and New Hampshire affords a parallel case. A boundary line three miles north of the Merrimac River, and parallel to its windings, was, by order of the King in council run out in 1741, and then remained in dispute for 150 years, having been finally accepted by

New Hampshire recently. A similar case is furnished by the so-called Land Grant railroads, where the alternate sections of a strip of land 20 miles wide on each side of the track have been granted. The interpretation in such cases has been held to be that the parallel line is what the mathematicians call an envelope. If such a line is laid down for the Alaska-British Columbia boundary, it would mean that every point on the line was 10 marine leagues from the nearest point on the coast. All points east of it would be more than 10 and all west of it less than 10 leagues from the nearest point on the coast. Such a line is, I conceive, the one which most nearly conforms to the spirit and intent of the treaty.

This interpretation wholly excludes Great Britain from jurisdiction over any of the waters of southeastern Alaska. And she should be so excluded, for she ceded all those waters to Russia in 1825, and we bought them from Russia in 1867. She has never exercised or claimed jurisdiction over any of them. True, an attempt was made in 1834 by the Hudson Bay Company to violate the treaty of 1825, but it failed. The *Dryad*, a vessel of that Company flying the British flag, was in 1834 fitted out, armed, and sent to what is now Fort Wrangell, for the purpose of taking possession in his Majesty's name, and building a fort to control the mouth of the Stikine. But the Russians were alert and a few days or weeks before the English arrived, Lieut. Zarembo, of the Russian navy, had landed, erected a stockade, mounted guns, and unfurled the Russian flag. Great Britain thereupon charged the Russians with violating the treaty of 1825 and demanded satisfaction. This well-known story was told me many years ago by one of the English participants who naïvely remarked that "when we arrived we looked the situation over, concluded they were too strong for us, counted noses, and sailed away."

When Russia and Great Britain were dividing their possessions in 1825 the existing interests involved were those of two great and rival fur companies, the Hudson Bay Company, and the Russian-American Company. If the range of mountains shown by Vancouver as approximately paralleling the coast actually existed, it would form a natural barrier between territory occupied by Hudson Bay traders coming overland and that similarly occupied by Russian traders approaching by sea and penetrating all the navigable waters of this intricate coast. The Russians had at that time secured actual control of all this coast and the trade on its border, while the English had secured control of the interior trade. So much of the convention of 1825 as relates to territorial division was simply a formal recognition and declaration of the *status quo*. There can be no doubt that the underlying principles by which the negotiators were guided were to formally define and confirm to each party exclusive jurisdiction and control over those regions of which each had in fact acquired control. This view is sustained by the historic facts, by unquestioned acquiescence for 60 years, by the spirit of the treaty, and by its language, with a single exception. Adopt the ten marine league provision, which is the exception above noted, and there can be no boundary controversy. There will then be left a boundary question, and that question will be the practical one of marking out on the ground a line parallel to the winding of the coast. This is easily done on paper in accordance with common sense and legal precedents. Draw a line such that all points upon it are ten leagues from the nearest point on the coast. Every point on the Alaskan side of it will be less than, and every point on the Canadian side more than, 10 leagues from the coast. Having drawn such a crooked or curved line or series of curves, let the commissioners proceed to straighten out its senseless crooks and substitute a line near enough to it for all practical purposes, and which shall consist of a series of straight lines or lines which can be readily surveyed and marked. Such is the Alaska boundary question.

The American Claim.—The Americans have made no claim. On all American maps, however, and all other maps down to 1884, the line has been drawn along the parallel of 54° 40′ to the mouth of Portland Canal, thence up that canal, thence roughly parallel to the coast to the 141st meridian, and thence north along that meridian to the Arctic Ocean. West of that line Russia and after Russia the United States have always exercised exclusive jurisdiction. Such a line is specifically prescribed by the treaty, and no American student of the subject has ever been able to discover any reason for doubting that line.

The British Claim.—The British have made no formal claim. But as the time approaches for marking the line in accordance with the mutual agreement between Great Britain and the United States, certain Canadian publications are seen to foreshadow not a simple boundary question, but a boundary dispute, and a dispute which promises bitterness if any of the sundry lines which Canadian map makers have drawn in American waters are seriously adopted and contended for. Since 1884 it has been the practice of Canadian and English map-makers to carry the line "from the southernmost point of Prince of Wales Island" up Clarence Strait into Behm Canal, and thence along that canal to latitude 56°, thus indicating that about 5,000 square miles of territory ceded by Russia to the United States had by this process become British territory. This change was made on an official Canadian map of 1884. As for the rest of the line on that map, it was carried around the head of all inlets, thus leaving those inlets in Alaska. Three years later another official Canadian map appeared in which the northern part of the line was no longer carried around the heads of the inlets, but across them, and the line throughout its extent moved much nearer the coast. It is this pushing the boundary line over on to Alaska territory and away from its old familiar place where the treaty put it that foreshadows the British claim.

Will Great Britain seriously and formally contend for such a change? Will she, under the guise of determining and marking the line in accordance with the spirit and intent of existing treaties, seek by making unwarranted claims to acquire territory? This will be made known ere long. Meanwhile let it be hoped that the newspapers and jingoes are all wrong and that her claim will be just. If just, there can be no boundary controversy; if unjust, no arbitration.

GEOGRAPHY FROM NATURE.

BY

RICHARD E. DODGE.

Teachers and students of geography are rapidly coming to recognize that the features of a region that we call geographic—the location of land and water in their various forms, the distribution of climatal regions, the habitations of man, his customs, characters, occupations, etc., are very largely determined by physiographic conditions. In order, therefore, to get at the true meaning of the geographic conditions, as we now see them, we must understand the physiography.

Such an intimate knowledge of the geographic features of a region as is most helpful and suggestive cannot be attained unless study is made of the features themselves, as they exist in nature. From the knowledge of the forms and processes to be seen about us, we gain a power to obtain a realizing sense of the geographic conditions of regions of the earth that we can have presented to us only through the words of travellers. Excursions then, for both teachers and students, ought to be a necessary part of geographic training. Excursions are bound to come sooner or later, and this short paper is a plea for their inauguration at once—wherever possible. The beginning may have to be a small one, but let there be a beginning soon. The outlay of time and money is not necessarily large, and I know from experience that teachers are more than repaid for any efforts that they make.

Any locality becomes a possible centre for the starting of such excursions, and under good guidance almost any place becomes profitable for minute and valuable study and illustration. I propose in the following pages to suggest the lines along which excursions should, to my mind, be conducted, and to illustrate my meaning by using New York City as a type centre from which to start. This, with the hope that excursions may be inaugurated in the near future, for the help of the public and private teacher of geography in this city and vicinity.

Analyzing any region of a rugged character, such as New England and New York, we find the physical features to consist of highlands and lowlands and intermediate slopes. The highlands may be of a more or less even altitude and continuous; or interrupted, rugged and serrate. The lowlands may be the seat of streams of varied sizes or of arms of the sea. In any case the topographic forms are as they are now, because of what has happened in the past. They represent the resultant of the interaction of the processes of erosion on materials of varying hardness, modified more or less by the relative height of the land in reference to the sea.

Physiography has to deal with topographic forms as the result of processes which may now be seen in action, and naturally extends its realm to explaining how form has influenced human and organic history. Hence in studying the history of any region, such as New York, the physical features, as the result of process, become the foundation. Let me then first describe the features of the vicinity of New York City in a large way, and then offer a few suggestions concerning localities where a detailed study of processes and form can be made.

If we should climb to the summit of any altitude in north-eastern New Jersey, southern New York or south-western Connecticut, we should find all the harder rocks of the region,—the traps, schists and gneisses,—rising to an accordant skyline, not quite horizontal, but gently rising from sea-level inland. Above that skyland rise a few small peaks. Below it lies a lowland of considerable extent occupied by rivers, as the Hackensack and Passaic.

The even skyline is now known by geographers to show that, in what geologists call the Cretaceous times (day before yesterday geologically) the region hereabouts was worn down to sea-level or base-level. The remnants, or Monadnocks, rising above the skyline, were the little headlands or islands not worn down, because more resistant or more favorably situated to withstand the processes of erosion. At the end of Cretaceous times there was an uplift of the land in reference to the ocean, which gave new vigor to the streams, and the lowlands now found along the belts of softer rocks are evidences that in the succeeding, or Tertiary times, the regions were again worn down close to the sea.

These two most conspicuous features in our landscape—the skeletal frame that underlies and gives the general character to all our present topography,—are then features that have been made geological ages ago, and have been preserved until now, more or less altered by subsequent changes. The superficial detail of form we find to be largely due to the effects of the last ice epoch, which came at the beginning of the present geological age. The ice ploughed up the western slope of the Palisades, scoring them most beautifully, crossed the Island of Manhattan and, standing with its melting edge over central Long Island, made from the rocks, gravel and sands it was carrying, the moraines that make the backbone of the Island, and the gravel plains that occur to the south and southeast of the moraines.

The last touches to the topography have been given in recent times and are due to the work of the atmosphere, the wind, the ocean and organisms. This work is still going on, though the changes are so small day by day that we cannot at first realize the importance of the process. Finally after the present topography was almost complete as we now see it, the region sank, the ocean waters advanced far inland along the lowlands of the Hudson, East River, and other rivers—once the seats of small fresh-water streams,—and a new line of contact between ocean and land was made. Thus the Bay of New York became a good harbor, with good anchorage, good access to the ocean and inland, well protected from winds and storms and in every way admirable. But for the recent sinking of the region, New York Island would have been but a small hill rising above a general plain nearly seventy-five miles inland.

This story has been read by the geologist and the geographer from the rocks and hills, the valleys and rivers, and we must take it for the basis of our further study, following as much into details as our elementary knowledge will permit.

With its past thus written in its physical features, the vicinity of New York becomes a wonderful field for the study of the relation of topography on the one hand to the conditions that have determined it,—the erosive processes, the geological structure and character of the rocks,—and on the other hand to the things it has largely determined—the human history. It thus becomes a region where, above all others, field excursions to see geography out of doors are very profitable and very possible.

In the conduct of field excursions the following plan seems to me, from some experience, to be the best. After a series of elementary introductory exercises and lectures in the house, the class should be taken out to see those processes in action that can best be studied in the region. The processes, and in a small way their effects, can be studied at the same time. Later, comparisons may be made to larger examples. The processes best to be seen in such excursions are the work of the atmosphere and rivers, wind and frost, the ocean and glaciers, taken in the order named. Any of these may be well seen in the near neighborhood of New York City.

After such a study of the work of the form-producing agents, a study of the larger forms of the region from some elevated peak should be made, and also some study given to the effects of uplift and depression on the rivers and the ocean.

The foot of First Mountain at Upper Montclair, N. J., or the foot of the Palisades, at almost any spot, is a very fine place for the study of the work of the atmosphere, frost, gravity and a river. The vertical cliff of hard rock at the top and the talus of loose material, pulled down by gravity, give us two contrasts of slope whose meaning becomes at once clear to the youngest. The fresh trap compared with the surface of any block exposed to the weather shows the origin of the fine soil that occurs in the talus. The presence of the cracks in the rocks, wet with trickling water and perhaps occupied by small roots of trees, gives a fine example of the weathering and loosening processes at work. The relation of talus to hard rock and the effects of weathering are at once brought home to the observer. That the rocks of the ridge are becoming gradually broken and carried down toward the ocean is accepted without question.

If the excursion be to the foot of the Palisades, the work of the river in slowly removing the débris of the talus, and carrying it down stream in fine particles, is one that any child can and will observe, and thus the far-reaching effects produced by the interaction of the great subaerial processes of erosion and transportation are brought home to the mind of even the most uninitiated. If the student be a child, he at once realizes, as never before, that the shape of the earth is changing, that soil is the weathered rock, that highlands are high because resistant. Geography becomes to his mind for ever after a vital subject and what is even better, it becomes personal. The child feels that work is being accomplished and energy expended, and is impressed thereby. As one is awe-struck and fascinated by the work of a great engine, so we find the child, thus brought face to face with the great forces of Nature in their activity, is fascinated. He at once becomes desirous of watching the forces and studying the detail of form that plays over the features of the earth as the processes go on in their work. A hill is to him no longer an accident. It has a meaning.

If an excursion be made to the foot of a steep slope beside a river as at Fort Lee beside the Hudson, the position of the river in reference to the soft rock can be shown, for soft sandstones outcrop at the foot of the Palisades at that point. That rivers tend to follow the softer rocks is a generalization that can be easily worked up to from this instance. If the Hudson does, the others ought to do so, and a map shows in the house, if we cannot go afield, that all the more important rivers of the vicinity of New York follow limestone belts in the harder schists and gneisses. Harlem River, Spuyten Duyvil Creek, Bronx River and Croton Lake are splendid examples of limestone soft rock lowlands occupied by water channels.

From such a study, passage can at once be made to the influence the rivers, in following the softer rocks, have had upon the paths of movement of man. That the railways follow the rivers and hence the lowlands, is a problem that any child will work out for himself if the suggestions be rightly given. The New York Central, the New York and Harlem River and the New York and Putnam railways are fine examples of such railroad paths. That the physical features of the land have had a great influence in determining certain of the habits of man is at once secured in the mind of the child or teacher, and they are ready to pass to questions a little more complicated or to a study of the other great form-producing processes.

After such a study of a river, a most excellent excursion is to some small ploughed field in the fall or early spring. If that field be on a hillside the formation of river valleys, their parts, the making of alluvial plains and deltas, and all the features of a whole river system can at once be seen in the miniature. Comparisons can be drawn between the features thus seen in a small way and the larger features of noted streams. The Rhine, the Mississippi, the Ganges, the Colorado and many other rivers of note can be shown in type. Above all, a comparative study of the parts of a small system, such as is to be seen in a ploughed field, brings out the meaning of the aging of a river, and the features of young, mature and old river valleys are presented so that the child of seven can at once classify the larger rivers of the world in their most conspicuous features. I have found from experience that teachers of several years' standing found more help from such an excursion as I have mentioned, than from any amount of illustration by picture or word.

After the subaerial processes have been studied as fully as time and circumstances will allow, an excursion should be made to the ocean shore wherever possible. Any shore like Far Rockaway, Arverne, etc., on Long Island or any of the accessible New Jersey shores, are splendid fields for study. Here we can see the ocean at its work of carving the land and carrying away the waste materials,—the chips of the carving,—to the depth of the sea. The work of the waves, the undertow, the tides, etc., can be well brought out. The formation of beaches, their daily change with each incoming tide and wave, the wave marks and ripple marks and the work done by little streams of water on exposed sand flats between tides, are worthy of a great deal of study and full of suggestion. We can at a shore usually see illustrated in a small way all the great processes of continental wear and building. In the pool left between two small ripple marks we may often find the miniature of the land east of the Appalachian summits with the accompanying deposits off shore that extend more than a hundred miles to sea. Once more we can here illustrate small things that at the same time serve to depict the processes so large and extensive that no eye can see them in their entirety.

Another phenomenon very frequently to be seen at a shore is the work of the wind in drifting the sand. We have here in the small dunes the type of the dunes of the Sahara, and on a windy day one gets a good illustration from personal experience of the cutting power of sand. Any of these features may be found along the shore of Long Island and a day, or even half a day, spent there is full of profit and helpfulness and of suggestions to the pupil, or to the teacher whose mind has not yet crystallized into such a state that it cannot adopt suggestions.

The other great form-producing process, the work of ice, cannot be studied in action in this vicinity. We can only study the results. Teachers and children asked to explain the scoring on all the harder rocks, the presence of isolated boulders on a foundation unlike them in composition, the distribution of clay and gravels, must recognize the work of some great agent not hitherto seen. The scratches would indicate a heavy dragging mass of something. The presence of the isolated boulders would suggest a great transporting agent that climbed the hills and paid but little attention to highlands and lowlands. The gravels should in their roundness suggest the work of water, and the morainic accumulations should suggest a dumping-ground where no sorting took place. Central Park, Mt. Morris Park, Van Cortland Park, the heights of Long Island, and many other places show the work of ice wonderfully well. In crossing Long Island to the ocean a fine section of the moraine is seen, and the topography can be well studied. Almost any cellar digging in New York City will show the washed gravels, and there are chances on every hand to bring out the work of ice by illustration and by suggestion. I have found that even the younger children will accept the work of the ice sheet with clearness and without question, and will bring in many illustrations thereof that they have found in their wanderings.

After the processes have been studied thus, an excursion should be made to some unwooded hill, like First Mountain at Upper Montclair, N. J., to get a view of the larger physical features. From such an eminence even the younger children can see the meaning of the flat horizon line. They can picture in their minds that the whole land will in the course of time, other things remaining equal, be worn down to such a plain, close to the level of the sea. They get from this an idea of the great power of what would seem at first to be slight energy acting through a long time. The meaning of highland and lowland, of slopes and of the true office of rivers and ocean, atmosphere, and rain come home to them. Topography has then a meaning and a significance of great importance.

They are then ready to conceive the greater highlands and lowlands of the world and the conditions of the greater rivers. They understand why the seats of several great civilizations have been and are along the plains of an old river. The study of geography can then be made by comparison, and similarity and dissimilarity become the keynote along which advance is made. Geographic features compared to a standard, that of the home locality, have a greater meaning and remain more clear in the mind of the learner than they ever can if they are taken up as if they were unrelated facts having no common cause and to be compared only by position.

Many other processes of a smaller importance might be seen in a few more field excursions, and in any one of the excursions that I have suggested much more can be brought out than I have the time to mention here. The skilful teacher who feels himself more at home out of doors than in, can make a day's trip full of interest from beginning to end. His suggestive mind will find an object of study in small details that would escape the victim of text-book knowledge. Thus the well-trained teacher can teach not only the principles of geography in the field, but also the fact that the story is there for any one who will read it. Apparently trivial things are found perhaps to tell the greatest and most interesting story. Children are taught the value of alertness and of a questioning mind, ever ready to follow the suggestions Nature offers.

After one has seen in the field, from some height, the effects of the rising and sinking of a land, the forms of shore lines in a large way may be attempted. Even the smaller child will see that the shore line of Connecticut or Maine is irregular because the rocks are hard and soft and the ocean has eaten into the softer streaks. They will compare the regions where there are such contrasts of rocks with a region like the shore of New Jersey where there is no such contrast. They will see that a sinking (drowning) of the land would make good harbors along an indented coast and that a smooth shore of either hard or soft rock makes a shore line devoid of harbors, and to be shunned by vessels. A study of the situation of large centres of habitation on the shore of New Jersey and of Connecticut, gives the examples illustrative, at home, of the dependence of man on the shore features and the recent history of the land. The reason for the great civilization and early commerce of Greece and Rome is at once brought home to the mind by comparison.

A more careful study of the effects of drowning upon a land and a river may be made in the case of New York City. The presence of tide water to Albany is an evidence that the region has sunk. A slight demand upon the imagination will serve to bring out the conditions of New York City had there been no sinking. The Hudson would then have been a small stream with water flowing down from a small drainage area, and the East River would have been but a smaller tributary. The effect of this drowning of the Hudson has been of the greatest importance upon the history of the whole continent. Tide water to Albany determined the position of the earlier trading posts there and along the Mohawk, all in easy communication at every season with New York and the Mother Country. It meant the development of agriculture and consequent colonization there and westward, into the great Plains along the natural pathways of commerce. It meant the final triumph of the English over the earlier settlers. It meant the present supremacy of New York City in its commerce, because of its easy communication, on the one hand with the great agricultural and mineral lands of the Western and Central States, and on the other its excellent harbor and easy communication at all seasons with European ports.

Agriculture and mining would have been just as possible had the region stood several hundred feet higher in reference to the sea, but commerce would not have been. That was determined by the recent continental movement that gave conditions favorable to inland trade by the Hudson and Mohawk, for coast-wise trade through the Sound, and of European trade because of a harbor suited for vessels of deep draught. New York, the great seat of the "middle man," the great seat of export trade, has been made possible through many causes, but above all through the recent movements that have made the present physiographic conditions what they are.

That any city depends very largely upon its physical conditions for its growth no geographer at the present time hesitates to affirm. The very great importance of this fact is but more recently coming to be recognized.

The beginner in geography who is striving to master the lines of commerce and trade, the distribution, characters, customs, habits and occupations of peoples, finds these facts to his mind very much the result of accident. Experience may give him the conception, after many years, that topography and the physical history of a region have largely determined the human and organic history. His understanding of geography will be greatly hastened and eased if he can be given the influence of physiography at the start of his study of geography. It becomes the basis of classification of facts, the cause to which he can always refer and get helpful suggestion. Location of places becomes easy, for location is not a thing of accident, but the result of cause.

If a child recognize through observation early in life that form is the result of process and be shown the process, his eyes become opened, his interest awakened, and even very young children find a meaning in "dead" nature that is astounding to them and gives a quality to their conception of life that bears a rich fruit. Although many of the best text-books at the present time are giving geography along the lines of physiography, and are very helpful and suggestive, no child gets such a realizing sense of the actual thing from any source as he does from observation of the fact itself.

If the conditions do not allow of regular excursions for the child, he should be urged to bring in all he can from his own small excursions with parents and friends and from his paddling in the water of the gutter after a rain storm. But if he can see nothing by himself he ought to be given the chance to see through the well-trained eye of a good teacher.

Unfortunately many teachers have not an appreciative and questioning eye for the facts and features of nature, because they have never been trained in that regard. Such teachers if they would accept, should be given a chance to learn something of the features of the world about them from observation. Surely in a city like New York there should be some means provided, either by private or public expenditure, whereby at least those who would might make trips, under good guidance, to neighboring localities for the purposes of field study.

Such field excursions have been given to the teachers of Washington, D. C., with interesting and profitable results. The plan has, I believe, also been tried in several other places. In all the cases that have come to my attention, the teachers have been glad to say that the outings have been of great profit to them.

New York City is very favorably situated for such field studies, and could such a series of excursions be started, many teachers would get at least a glimmer of a few of the ways in which physiography has determined the positions and habits of man. To such teachers geography would come to have some meaning, and the teaching of the subject matter would no longer, to the quickened mind, be but a perfunctory reviewing of pages of text. The spirit of the teacher would not allow any such deadening study of a live subject. In a series of five or six field excursions well arranged, and planned with an idea of leading from one subject rationally to another, the teachers would gain much that would be of great help to themselves in their private lives and in their teaching.

I have taken New York as an example of a centre from which excursions could be easily run because of its favorable situation geographically and because of its many lines of easy communication with points of special interest for illustration. Also because the city itself is such an example of the relation of man, in his progress, to the conditions of a physical nature about him.

New Haven, Hartford, Willimantic, Holyoke, Manchester, Philadelphia, Washington, St. Louis, Chicago and many other large cities are centres of almost equal value for illustration and study. In each case I have mentioned there is very much to be gained from a study of the physical features that have helped determine the position, growth and importance of the city. They are all cities in which the field method of study could be well prosecuted.

At the present time there is a great awakening in the methods of geographic teaching, and now is the time for superintendents, colleges, geographers and geographical societies to be of vast help to the schools by helping in the matter of excursions. The children, if possible, and at any rate the teachers, should be given the chance to study home geography, not from text-books, but from the only perfect geographic reader—Nature herself.

Let us hope that in the next few years excursions for teachers and pupils may become a fixed part of the curriculum in many of our cities and towns. And let us also hope that such a desired end may be hastened through the co-operative interest, beneficence and guidance of geographers, colleges and the geographic societies. The latter especially have, in the organization and conducting of excursions, a field that they can make especially their own and thus come more closely in contact with the people than they have many of them been in the past.

TEACHERS COLLEGE,
New York City.

RECORD OF GEOGRAPHICAL PROGRESS.

AMERICA.

THE MARYLAND GEOLOGICAL SURVEY.—Maryland is now added to the States which have established a State Geological Survey. The General Assembly passed the act in March last. The Survey is under the direction of a commission composed of Governor Lowndes, State Comptroller Graham, President Gilman of Johns Hopkins University, and President Sylvester of the Maryland Agricultural College. The Commission, on March 25, appointed as State Geologist Dr. William Bullock Clark, Professor of Inorganic Geology in Johns Hopkins University. The Survey is planning to take up first the study of certain economic questions, particularly the building stones, in which the coöperation of Professor George P. Merrill, of the United States National Museum, will be engaged. At the same time other subjects, including geological mapping, will be considered, and the students of the Geological Department of Johns Hopkins University will be engaged with the coöperation of outside experts on special points. In this work Professor Clark intends to consider both the coastal plain formations embracing the Cretaceous and Tertiary deposits, as well as the Appalachian formations of the Palæozoic. Investigation upon the crystalline rocks will also be carried on in connection with the work upon the sedimentary series. The purposes of the Survey, as set forth in the Act, are:

(1.) An examination of the geological formations of the State, with special reference to their economic products, viz., building-stones, clays, ores and other mineral substances.

(2.) An examination and classification of the soils and a study of their adaptability to particular crops.

(3.) An examination of the physical features of the State with reference to their practical bearing upon the occupations of the people.

(4.) The preparation of special geological and economic maps to illustrate the resources of the State.

(5.) The preparation of special reports, with necessary illustrations and maps, which shall embrace both a general and detailed description of the geology and natural resources of the State.

(6.) The consideration of such other scientific and economic questions as in the judgment of the commissioners shall be deemed of value to the people of the State.

THE UTMOST SOURCE OF THE MISSOURI RIVER.—Mr. J. V. Brower, whose researches at the headwaters of the Mississippi are well known, returned in June this year to the head sources of the Missouri River to complete the explorations which he conducted there in 1895. He intends to make a detailed survey of the sources of the Missouri for a final chart to replace the provisional map that appears in his book, "The Missouri River and its Utmost Source," just published. He expects that it will require ten months to complete the work. He ascertained last year that the largest upper branch of the Missouri does not flow through the lower Red Rock Lake in Montana as was supposed, but issues from a cavity of volcanic origin, at the summit of the Rocky Mountains, west of Henry's Lake, Idaho, and just across the boundary between that State and Montana. According to his observations, this ultimate source of the Missouri is in 44° 35′ N. latitude and 111° 38′ W. longitude, and is distant 2,945 miles from the mouth of the Missouri and 4,221 miles from the Gulf of Mexico. The elevation above mean sea level is about 8,000 feet. Mr. Brower started from St. Paul on his journey to the Missouri's sources on July 28, 1895, and the following statement of his work is condensed from his new book.

Passing through Helena, Mont., he went south to Lima in the same State, a little town in the valley of the Missouri about ten miles above the red butte from which the river at this point takes its name (Red Rock Creek). In order to identify the headwater branch of the Missouri it was necessary to determine the relative importance of all the larger, upper branches and this work occupied from Aug. 6 to Aug. 28, leading to the conclusion that the stream flowing through Culver's Cañon into the so-called Red Rock Creek which, lower down, is known as the Missouri, was, probably, the ultimate source of the great river. On Aug. 29, therefore, Mr. Brower re-entered Culver's Cañon, whose exploration he had begun on Aug. 5.

His party advanced with much difficulty up the cañon, as ledges, declivities and fallen timber constantly impeded the way. The summit of the Rocky Mountain range towards which they were struggling was in full view. Following the stream, the party finally arrived at a small flat, of a marshy nature, at the west end of which is a little body of water which Mr. Brower named Lillian Lake. The stream does not run through it. A short distance beyond Lillian Lake, Mr. Brower suddenly came in full view of a hole in the summit of the Rocky Mountains, just west of the crest of the main range. Circled around are numerous peaks.

"From this Hole in the Rocky Mountains," writes Mr. Brower, "the little rivulet, two feet wide and scarcely two inches in depth, drawing its utmost supply from the uplifts surrounding it, takes its course out into and down through Culver's Cañon to the valleys below, broadening, deepening and strengthening from the base of adjacent and enormous ranges on every hand, until its turbulent waters, severing the mountains and channeling the valleys, open the gate to an issue in the parent ocean, thousands of miles away, by the longest continuous and uninterrupted river channel known to the world."

Mr. Brower believes that his work is the first discovery of the utmost limit of the channel of the Missouri River, but if any legitimate record exists of an earlier geographical exploration of the locality he and his companion (Mr. Culver) will cheerfully yield the honor of a first discovery.

GEOGRAPHICAL RESULTS OF THE GEOLOGICAL SURVEY OF CANADA IN 1895.—A summary Report of the Geological Survey of Canada for 1895, by Dr. George M. Dawson, Director, has been published (Ottawa, 1896). While geographical exploration was not so prominent a feature of the work as in 1894, some geographical results of importance were attained. In the northern part of Quebec province Dr. R. Bell crossed the height of land from Grand Lake, near the sources of the Ottawa, and descended the Nottaway (Noddawai) River to its mouth at the southern end of James Bay. The country he crossed was comparatively near to the inhabited parts of Quebec, but much of it had not been mapped, and it was uncertain whether the river that took its rise near Grand Lake was a part of the Nottaway system, or was included in a more western fluvial system. Dr. Bell met here a large area of Huronian rocks. It is the rocks of the Huronian system which contain the auriferous quartz veins in the Rainy River and Thunder Bay districts of western Ontario, where Mr. W. McInnes has just collected the information needed to produce the Seine River and Shebandowan map sheets which will facilitate the work of miners who are seeking gold. Typical Huronian areas are also found in the neighborhood of Lakes Temiscaming and Nipissing and the adjacent Sudbury district. The latter is well known for its nickeliferous pyrrhotites, and this metal is being found in the Huronian areas above referred to.

Systematic surveys of both sides of the lower Ottawa were continued by Dr. R. W. Ells, and in the region between the Ottawa and the St. Lawrence, and their geological features in some detail are now being laid down on a scale of four miles to the inch.

Mr. A. P. Low continued his explorations in the Labrador peninsula. He ascended to the sources of the Manikugan River and examined the country on both sides of the main water-shed there. Granites, Laurentian gneisses and limestones, with intrusive anorthosite, characterize the whole region he traversed.

Mr. J. B. Tyrrell carried out exploratory surveys northeast of Lake Winnipeg in Manitoba, mapping the courses of several rivers and locating the positions of a number of lakes. Granitic and gneissic rocks characterize the whole of this district.

The work of the survey was largely devoted to the mapping of definite areas, particularly some of those which are deriving special interest on account of their metalliferous resources, such as the West Kootanie district of British Columbia, into which a large mining population is gathering where there were no white inhabitants a few years ago. Thus, Mr. R. G. McConnell has been engaged upon the geographical, topographical and geological data needed for the West Kootanie sheet of the geological map, Mr. J. McEvoy has been working upon the Shuswap (British Columbia) sheet, Mr. H. Fletcher has been revising the maps of the Sydney coal fields of Cape Breton, Nova Scotia, and Mr. E. R. Faribault has continued his mapping of the Cambrian gold-bearing rocks of the Atlantic coast on a scale of one mile to the inch.

This mapping, not being based upon detailed and precise topographic surveys, of course necessitates considerable geographical work in the way of measurements, traverses of country and so on, and thus far adds to geography. The resulting maps are not products of the greatest precision, but the effort is to make them adequate for the scale adopted and they are far superior to all previous mapping of these regions.

THE SWEDISH EXPEDITION TO TIERRA DEL FUEGO.—Dr. Otto Nordenskiöld, leader of the Swedish Expedition which went to Tierra del Fuego in 1895, has sent to *Annales de Géographie* (No. 21, April, 1896) some information about the progress of his party, writing from Punta Arenas on Feb. 23, 1896. Dr. Nordenskiöld is geologist, Dr. Ohlin, zoologist, and Mr. Dusén, botanist of the party. After outfitting at Buenos Ayres they left, early in November last, for Punta Arenas on the north side of the Straits of Magellan. Dr. Ohlin has since made that town his headquarters and has been engaged in the study of the marine fauna of the Straits and the coast waters as far as Cape Horn. When Dr. Nordenskiöld wrote, he and Mr. Dusén had just returned from a trip in the northern and central parts of Tierra del Fuego. Its coasts are now very well known and are inhabited to a considerable extent, but the interior has been completely traversed only by the Commission which delimited the boundary between Chile and Argentina.

Starting on horses from the mouth of the Rio Grande, the largest river of the island, the explorers ascended an affluent of that river, the route being, in the main, parallel with the boundary line and about thirty miles east of it. In about 54° 25′ S. latitude they saw from a height Lake Fagnano, which was discovered by the Boundary Commission, and which is said to be nearly sixty miles long. The way south to the lake was open, but as Dr. Nordenskiöld intended to reach it from Admiralty Sound and to study the Cordilleras from that point of approach, he did not continue his inland journey further south.

While the northern coast region is dissected by numerous valleys this feature of denudation is not at all so conspicuous in the interior, the plain being low and often marshy as far west as the Cordilleras and drained by small streams without noteworthy valleys. South of the Rio Grande the country is forest covered, but is everywhere penetrable. Morainic material overspreads tertiary deposits and is itself covered with gravel, probably of former stream beds. Evidences of a post-glacial uplift of from seventy to a hundred feet were observed on the west side of the traversed region. The Straits of Magellan form, only in some special instances, a zoological and botanical boundary. Dr. Nordenskiöld expected to remain on the island until the beginning of the Antarctic winter.

TOPOGRAPHICAL MAPS IN GEOGRAPHY CLASSES.—The Conference on Geography in 1892 emphasized the importance of placing good topographical maps in the hands of students. A committee of the Conference made a valuable report on "Governmental Maps for use in Schools," describing over fifty phases of topographical relief that are well illustrated by maps, which may be obtained free or for a nominal sum. In the four States whose topographical maps have been completed, the sheets may be used with much advantage in the study of local and State geography. Inquiries addressed by the Society to the Boards of Education in these States have elicited the following information:

In Massachusetts the students in the normal schools are now receiving some training of a nature to enable them, as teachers, to illustrate the physiographic side of geography by the use of the map sheets. Such instruction is also given to some extent in the high schools. A copy of the State map (fifty-four sheets) was given in 1895 to each of the high and normal schools. It is not supplied to the grammar schools.

Rhode Island is just publishing a monograph by William M. Davis, Professor of Physical Geography in Harvard University, with the design of aiding teachers to use the map sheets advantageously in the class-room and in outdoor study. Instruction to this end is also given in the normal but not in the high schools. The State distributes the map (twelve sheets) free to all the public schools and libraries. The map is not yet used to any extent in the grammar and high schools.

Connecticut does not distribute the State map (thirty-three sheets) free of charge. There is beginning to be some demand for it from the public schools, and students in the normal schools receive some instruction in physiography, but little or nothing is yet done in this line in the high schools. The State has printed and will supply to teachers a pamphlet of fourteen pages by Professor William M. Davis, entitled "The State Map of Connecticut as an Aid to the Study of Geography in Grammar and High Schools." The pamphlet deals chiefly with the manner in which the forms of land and water, soils, climate, etc., and sources of power such as coal, water-falls, etc., in their relation to the occupation of the earth by man, may be brought more clearly to the understanding of young scholars by the aid of the State map. This little work is a timely and much needed Aid for teachers, abounding, as it does, in suggestions for the more scientific teaching of geography. The Connecticut Normal schools, next season, will give instruction in the line indicated by this pamphlet.

New Jersey has distributed her map (twenty sheets) to all the public schools. It includes a general map of the State, a relief map indicating altitudes by shading, and a geological map.

EUROPE.

THE DANUBE SHIP CANAL.—The lower Danube is about to be opened to navigation by large boats by the completion of the ship canal at the Iron Gates. For forty years the passage of the Iron Gates, at all times difficult and dangerous, has been impracticable for an average of 117 out of the 275 days of navigation in the year, for boats drawing five feet, and at no time has the river been navigable between Bazias and the Iron Gates, eighty miles further down the river, for boats drawing more than six feet. The interruptions begin just below Bazias, where the Danube quits the Hungarian plain, and in the succeeding eighty miles to the Iron Gates the bed of the river cuts in several places almost at right angles across the strike of beds of crystalline schists and granites, creating rapids and rocky shoals. Finally the channel is barred by the Prigada reef, a wall over 350 yards wide, emerging above the surface at low water, running near the left bank for over a mile and then crossing diagonally to the right, just above Sibb. This wall, with smaller reefs, constitutes the Iron Gates proper, and has formed a dangerous cataract throughout its entire length. The obstructions between Bazias and the Iron Gate have been removed and a canal has been excavated through the Prigada and other reefs of the Iron Gate, along the southern or Servian side of the river. The canal is about two miles long, 260 feet wide and ten feet deep, and the Danube will now be navigable for the largest river steamers from Vienna to the Black Sea. The formal opening to traffic will occur on September 27, and the occasion will be a feature of the Hungarian Millennium festival.

ORIGIN OF THE BALTIC SEA.—The *Geographical Journal* for April prints a summary of a paper read at Lübeck, last year, by Professor Rudolf Credner on the origin and evolution of the Baltic Sea. The present condition of the Baltic is merely a stage in its evolution, and Professor Credner refers to the gradual changes in its coast line which are continuously in progress. The cause of the depression, now occupied by the sea, was a movement of the crust which, by a series of faults, let down a portion of the surface consisting of different geological series. The basin thus formed has been greatly modified by processes of erosion and accumulation, largely the result of ice action. Thus the main features of the Baltic were blocked out and then many striking features were brought about by gradual elevation and depression, as is shown by the evidence of the marine fauna, which was at one time that of salt water, then of brackish water, and again of fresh water; and so the changes went on as the rising or falling of the crust brought the general depression more freely into communication with the outer ocean or restricted or completely cut off its outlet. Observations on the Scandinavian and Finnish coasts seem to prove that the present is a period of slow elevation.

THE GEOLOGICAL EXPEDITION TO NOVAYA ZEMLYA.—M. Th. Chernyshev reported to the Russian Geographical Society on January 2, on the geological expedition to Novaya Zemlya last summer. The *Geographical Journal* says that the expedition, which left Archangel on July 22, landed at Matochkin Shar, the strait separating the two large islands, eight days later, explored its coasts and entered the strait, but its eastern end was ice-blocked and the steamer *Vladimir*, therefore, could not reach the Kara Sea at that place. The party, using sledges, crossed Novaya Zemlya in six days in the latitude of Little Karmakuly settlement, reaching the Kara Sea at Abrosimov Bay. Proofs were found of the glaciation of the land during the ice age and of the secular elevation, at least of the southern island, during recent times. Some geographical positions were fixed and the expedition returned to Archangel on September 21 with rich geological collections.

PROTECTING SCHLESWIG'S WEST COAST.—The Hallig Islands off the west coast of Schleswig protect that coast to a large extent from the destructive force of ocean storms. But some of the smaller of these islands have been damaged and are liable to be destroyed by violent storms. *Petermanns Mitteilungen* (1896, part II.) says the Prussian government has decided to build a dike of piles and bushwork around Oland, Gröde and Appeland to be connected by an embankment with the mainland, on the east, and also with the island of Langeness on the west.

AFRICA.

THE EAST AFRICAN DWARFS.—In Dr. A. Donaldson Smith's address before the American Geographical Society on April 13, on his sixteen months' journey, in 1894–95, among the Somalis and Gallas, from the Gulf of Aden southwestward to the salt lake Stephanie and Lake Rudolf, near the eastern limits of the Upper Nile basin, he alluded to his visit to a dwarf tribe living north of Lake Stephanie. In fact he is the only explorer who has seen any of the East African dwarfs in their home, though there has been undoubted evidence of their existence. Dr. Smith has supplied the following facts about the tribe he visited:

"The Dume pigmies inhabit a mountainous tract of country only five miles square and lying twenty-five miles north of Lake Stephanie. I did not have a chance to see much of them as I had to push on to Rudolf, but I do not think they number over 1,200 souls all told. They live in little hamlets composed of about thirty huts each, the huts being made simply of grass and weeds, roughly tied and thrown over bent sticks.

"The Dume have been conquered by a neighboring tribe to the

South called the Burle and are so hemmed in by different tribes on all sides that they have been unable to procure a living by hunting and have been obliged to raise goats and even to till the ground. They go absolutely naked, not even wearing sandals. Their average height is about five feet. They are quite black, but with a very slight copper tint in some cases. They are very well formed, but with negroid features. They have woolly hair and are uncircumcised. They still hunt elephants with poisoned arrows, but game is not abundant. They appear to have no idea of morality, but most of the men take a permanent concubine so as to raise a family they may call their own after they get well on in life.

"There is a tribe called the Bunno living just west of the Dume, two-thirds of whom are also undersized and they are undoubtedly related to the Dume, but intermarriage with other tribes has increased the size of many. I believe all the country north of the two lakes was formerly peopled by pigmies, as I saw so many undersized men and women among the Mela, a tribe I visited eighty miles north of Rudolf, among the Amar, a tribe west of Stephanie, and among several other tribes about these regions, besides the Dume and Bunno. It is probable that they are all degenerate species, except the Dume, who are of uniform size, but even they do not come down to the size of Stanley's pigmies,—four and a half feet. I collected a few words of the Dume language, which I shall publish in the appendix of a book I am writing, and which will be published next autumn."

Dr. Henry Schlichter of the British Museum collated (*Scottish Geographical Magazine*, 1892, June and July) all the reports about East African dwarfs with a view to answering the vexed question: "Do pigmy tribes exist in East Africa, and if so, where?" He made a careful summary of these reports and the evidence he adduced was conclusive proof of the existence of these dwarfs. He found that as far back as 1826 Captain Boteler had brought information about the East African dwarfs, and that when travelling in Abyssinia, Shoa and Kaffa, Messrs. Harris, Krapf, d'Abbadie and Hartmann had heard much of the existence of pigmies in the unexplored country just a little south; and that Avanchers, Krapf and d'Abbadie saw numbers of these dwarfs, though not in their habitat.

The evidence Dr. Schlichter adduced seemed to justify the conclusion that there were dwarf tribes living near the southern border of Kaffa, the southernmost part of Abyssinia, and in the neighborhood of the thirty-sixth meridian east of Greenwich, and the habitat of the Dume is near that meridian. The Teleki expedition which discovered Lake Stephanie (1888) did not penetrate quite far enough north to discover the Dume. It was supposed that one of these dwarf tribes was called the Doko, but Dr. Smith met this word only among the Galla people and it means "a poor man."

DESICCATION OF CENTRAL AFRICAN LAKES.—Mr. Alfred Sharpe in the *Geographical Journal* (1896, April) says that with the exception of the Shire River (outlet of Lake Nyassa), Luapula and Chambezi (eastern Congo sources), and the Loangwa (northern tributary of the Zambesi), he knows of no other rivers of British Central Africa that are navigable for any important distance. He inclines to the theory now most commonly accepted, that the gradual desiccation of Central African lakes, observable for some years past, will not be a persistent phenomenon, as some theorists have believed, but that it is merely one phase of the results of meteorological conditions not yet understood; that is, that there are succeeding cycles of rising or falling waters in these African lakes, due to increasing or decreasing rainfall. The evidence we have of the various levels of Tanganyika's surface since Burton's time tends strongly to support this conclusion. Some of the lakes also are silting up, as Lake Mweru, whose southern end is being filled with detrital deposits from the Luapula River, and great marshes there were formerly a part of the lake. Recent unusually dry years have allowed vegetation to get a hold on the shallow muddy bottoms of lakes Shirwa and Pamalombe (near the southern end of Nyassa) and are now converting them into marshes. Lake Bangweolo appears to be filling up in the same manner, at least at its southern end. There has not been much recent change in the level of Lake Nyassa, though a slight fall of level is indicated by the somewhat shallower Shire River, where the Nyassa waters enter it.

In the northern part of Nyassa, where the coasts are bordered by high mountains, Lieut. Gurney has recently made a line of soundings where no bottom was found at 1,800 feet, the length of his wire. Between these highlands, therefore, is found an unusual depression, the bottom of the lake being certainly more than 300 feet below the level of the sea, as its surface is 1,500 feet above it.

Mr. W. H. Nutt, whose account of his journey to Lake Rutwa, east of the southern part of Lake Tanganyika, in 1894, appeared in the *British Central Africa Gazette* (Oct. 15 and Nov. 1, 1895), likens the lake to a gigantic mud hole. The lake is very shallow for some distance from the shore, appears to be shrinking both in its northern and southern parts, and apparently receives few important feeders. The large evaporation caused by the burning tropical sun is at present certainly larger than the water receipts.

WILL THE AFRICAN NATIVES WORK FOR HIRE?—Mr. Alfred Sharpe, in his paper in the *Geographical Journal* (1896, April), says, the theory that the negro in tropical Africa cannot be induced to work regularly, except by force, is completely contrary to experience in the Shire Highlands, Lake Nyassa. At first there is a scarcity of native labor until the natives gain confidence in the new settlers. Then there is a flocking in of persons who desire to work. After a time many begin to acquire trades, such as carpentry, brickmaking and bricklaying, or learn skilled work such as timber sawing, overseeing, bullock driving and so on. The brighter men see that such occupations involve less hard work and command higher wages than mere unskilled labor. The news spreads that calico and other highly prized articles may be earned, and every year natives come in from more distant districts to obtain unskilled work.

These persons agree to work for six months, and at the end of that period they go home to till their land and use their earnings. At Blantyre the same men return again and again in succeeding years. So far from there being a scarcity of labor in these regions, more laborers at times come to Blantyre for work than can well be utilized. The natives are now living in better houses, they clothe themselves in calico and prints instead of in bark cloth and skins, they have founded permanent settlements around the white stations, native agriculture has increased and some natives in the Blantyre and Zomba districts are now cultivating coffee and wheat. Large numbers of children attend the schools and many can now read and write.

THE CONGO RAILROAD.—After a year spent in preliminary studies for the Congo railroad, before work was begun, the engineers reported that it might be built for $5,000,000. The commission which has recently inquired into the present condition and prospects of the work has reported that the total cost will be from $12,000,000 to $13,000,000, according to the time taken to finish it. This illustrates again the general rule that the cost of large engineering works, involving new problems, or carried out in new countries, is likely to be greatly underestimated at first.

In May the Belgian parliament voted an immediate loan of

$1,000,000 and guaranteed a further loan of $2,000,000, which practically insures the success of the enterprise. *Le Mouvement Géographique* (Nos. 9 and 13, 1896) says the line was open to Kimpesse, about 100 miles from its starting point at Matadi, and it was expected to complete it to Tumba, 116 miles, before August 1. This is about half way to Stanley Pool, and the engineering works still to be carried out are not of a difficult nature. The commission has reported favorably on the condition of the part of the line now open, and the progress making. The line should be completed, it is thought, by 1900.

AN AMERICAN NATURALIST IN AFRICA.—Mr. D. G. Elliot, the American naturalist, left London for Somaliland on March 27 to obtain a series of antelopes and other large African mammals for the Field Columbian Museum of Chicago. From Berbera, on the Gulf of Aden, he expected to travel southward over the high plateau to the Shebeyli River, where he hoped to find giraffes and Grévy's zebras. He will try to return to the coast by the valley of the Jub River, where he will look for the newly-described Hunter's antelope (*Damaliscus hunteri*). Besides his native party he has with him a London taxidermist and Mr. Dobson, who accompanied Dr. A. Donaldson Smith in his recent expedition to Lake Rudolf.

MOUNT KENIA.—The GEOGRAPHICAL JOURNAL for May has a brief letter from the British agent at Zanzibar reporting that Dr. Kolb, a former member of the ill-fated Freeland Expedition into East Africa, has returned from Mount Kenia and asserts that he has ascended it to its summit, from the upper waters of the Tana. The letter contains no particulars of the ascent nor information concerning the mountain, which is believed to be the second highest in Africa. Dr. Kolb says the people who inhabit and cultivate the slopes of Kenia have no common tribal name or government and are quite distinct from the tribes at the base, though speaking a dialect resembling that of the Wakamba.

THE FUTURE OF ERITREA.—Baron L. Franchetti's lecture before the Second Italian Geographical Congress on the development of Italy's Colony on the Red Sea (*Scottish Geographical Magazine*, April, 1896) has scant praise for Massowah, the port, and its neighboring lowlands, which as yet offer few opportunities for trade or agriculture. The plateau, however, with a mean elevation of 6,500 feet, has a mild and healthful climate, a large proportion of cultivable lands and abundance of water. Cereal and leguminous plants, the vine, olive and other fruits thrive, and agriculture may profitably be carried on. Ten peasant families went to Eritrea from Italy in 1893, each receiving fifty acres of land in the neighborhood of Godofelassi, which has an Italian garrison. Between November, 1893, and July, 1894, each family had cleared fifteen to twenty acres, planted them and the crops promised well. Little outcome can be expected from the lowlands between the plateau and the sea.

ASIA.

PROGRESS IN JAPAN.—Mr. James Troup, British consul at Yokohama, in a paper read before the Scottish Geographical Society in February last, said that although China proper has a population eight or ten times as large as that of Japan, her foreign trade through the open ports does not amount to twice that of Japan. In order to develop the Japanese merchant marine on European models, the government, in 1887, prohibited the building of junks of over ninety tons burden. Japan now owns 517 merchant steam vessels, of which 102 are ocean-going steamers. Japanese companies have established steamship lines from home ports to Shanghai, Corean ports and Vladivostock, and to Bombay; and vessels trade to other ports in the East. Inland transport has been greatly improved by the development of the railroad system. Considerably over 2,000 miles of railroads are now open to traffic, and extensions, now proceeding, will increase the mileage to about 3,000 miles. The industrial development is proceeding apace. The opening of the ports gave an immense stimulus to the production of silk, about half of which is consumed in the country, while the silk export is now worth about $22,500,000 a year. Mr. Troup also showed the impetus that had been given to the cultivation of tea, rice and other agricultural products, and to the mineral, timber and marine industries.

The people are better clad than they were thirty years ago, the uniforms of the army and navy and of civil functionaries have been remodelled in the Western fashion, and the attire of a very great many persons has been similarly changed. The ordinary population continue to clothe themselves mostly in cotton in the old style of dress. The use of goods from the West has inspired the Japanese with a desire to make similar articles for themselves. Considerable attention has recently been drawn to the fact that Japan may become more and more a competitor in supplying the Occident with goods that heretofore have been manufactured mainly in Europe or America. But Mr. Troup does not think the conditions for competing with the West are so favorable in Japan as they seemed to be a year ago. Food and labor are rising in price and the dearth of labor during the recent war seems to be now accentuated by emigration to Formosa; but in time, Japan is likely to largely supply herself at home with the textile fabrics and the machinery she now imports.

SIBERIAN RIVER SURVEYS IN 1895.—The Russian *Official Messenger* reports that the Siberian hydrographic expedition, last summer, under Colonel Vilkitzki and Lieutenant Ivanoff, was very successful. The expedition left Yeniseisk on June 25, explored the unsurveyed parts of the lower Yenisei, surveyed the eastern shores of Ob Bay, which had been very imperfectly mapped, reached Obdorsk, which is now becoming the centre of the whole region, next entered the Irtysh and went to Tobolsk. Next year the exploration of the Ob will be resumed. The explorers say that the difference between high and low water in the Yenisei, which is nearly three fathoms at Yeniseisk, decreases in its lower course and ceases to be felt in the Brekhovskiye Archipelago. The current, which is five knots an hour in the narrow upper parts of the river, decreases to three-fourths of a knot in its lower course. The lower river may be navigated as far as Turukhansk, 670 miles, without a pilot. With a pilot vessels drawing 21 feet may navigate as far as the rapids, 1,000 miles from the mouth, and in the spring, there is a four-fathom depth nearly up to Yeniseisk. The shoals are wholly along the shores and are now well mapped.

The most important discovery made was that Ob Bay is not so wide as it is shown on the map, and has not the straight direction it was supposed to have. Under 72° N. lat. the eastern coast of the bay suddenly bends to the west and runs for forty-five nautical miles westward. Under the 71st degree it turns eastward again and only then runs due south, the errors of the best maps in the position of the coast attaining as much as 30 to 35 nautical miles.

THE POLAR REGIONS.

MR. PEARY'S NEXT EXPEDITION TO GREENLAND.—About July 8, Civil Engineer R. E. Peary, U. S. N., will start on his fourth journey to Greenland. He will visit Cape York, Whale Sound and Cape Sabine to complete in some details the investigations that have so long engaged him. He may be able to extend his survey of the coast line, already completed from Cape York to Cape Alexander, as far north as Littleton Island. He will also endeavor to enter Jones Sound, which has not been penetrated to any extent since Inglefield's voyage in 1852. If the ice conditions in Melville Bay are favorable he will secure the large meteorite on the north shore of that bay, which he was unable to bring home with him last year, though he secured two smaller specimens. This purpose, however, may not be attained unless he can place his vessel within convenient distance of the shore. He expects to add much material to the fine collections he has already brought home. Mr. Albert Operti, the artist, will go with him and will take casts of the Cape York natives for the purpose of making typical models. On the way home Mr. Peary will probably visit Cumberland Sound and spend a week in Hudson Strait.

Two parties of scientific men will take passage on Mr. Peary's ship and will land south of his field of work to pursue their own investigations. A party of four or five young men from Cornell University, headed by Mr. Ralph S. Tarr, the geologist, will go to the neighborhood of Devil's Thumb, Melville Bay, to make collections and geological and glacial researches. Prof. A. E. Burton, of the Massachusetts Institute of Technology, with four or five comrades, will be landed at Umanak Fiord, Southwest Greenland, where they will make pendulum observations and study glacial characteristics and movement. Both parties will return with Mr. Peary.

S. A. ANDREE'S BALLOON JOURNEY.—Mr. Andree, and his two companions, Mr. Nils Ekholm, the Swedish meteorologist, and Mr. Strindberg, expect to start on their air voyage from North-western Spitzbergen late in July or early in August, somewhat later than the date previously mentioned. Mr. Ekholm recently made a long statement in the Swedish press in which he said that the balloon cloth used had been put to the severest test and would sustain a pressure nearly twenty times as great as it would be subjected to, while the escape of hydrogen gas would be so small that the balloon might be supported in the air for a much longer period than the two weeks or less which, he believed, would be the time limit of the voyage.

Some expert aeronauts, as well as many meteorologists, do not share Mr. Andree's faith that the outcome will be fortunate. Herr A. Berson, who has made thirty-five balloon ascents, and who read a paper on "Geography and Ballooning" before the Berlin Gesellschaft für Erdkunde on January 7, expressed the opinion that Mr. Andree's expedition is the most hazardous ever undertaken by explorers, and that it has little chance of success. We know nothing of the region, he said, either on the Siberian or the American side, between the Pole and 70° N. latitude, a stretch of 1,350 miles. We know very little about the winds between Spitzbergen and the Pole, but it is apparent that the atmospheric circulation in the belt of moving depressions round the Pole cannot be favorable to a long balloon journey. Herr Berson added that he had found journeys of only 180 to 300 miles with balloons of a volume up to 160,000 cubic feet extremely difficult during rain or snow. He feared that Mr. Andree and his two companions would throw away their lives.

The effect, in decreasing the buoyancy of Mr. Andree's balloon, of his immense spread of cloth, in an atmosphere that is likely to be filled with snow or frost, remains to be tested. It will be remembered that when Mr. Peary was travelling at an altitude of 8,000 feet above the sea a stick stuck in the snow was often thickly covered with frost crystals, on the windward side, in a few minutes. Mr. Peary's wearisome experience with fog also suggests the possibility that Mr. Andree might drift clear across the Polar area without once catching a glimpse of land or the ice-covered sea.

The young Frenchmen, Bissanc and Hermite, planned to start in 1892 in a monster balloon for the North Pole, but the idea was so severely criticised that they did not make the attempt. They looked for encouragement to the Paris Aeronautic Society, but, at a meeting of that body, there was loud applause when the president advised the young men to give up the attempt and declared that there was not one chance in a thousand that such an enterprise could succeed.

WASHINGTON LETTER.

WASHINGTON, JUNE 25, 1896.

Geography and the 54th Congress will be a proper and interesting subject of review. The session just closed was not fruitful of direct legislation which will affect geographical features, but several measures were inaugurated, and some older ones advanced on lines that may modify existing conditions. The subject of internal waterways was prominent.

LAKE SUPERIOR AND MISSISSIPPI RIVER CANAL.—Major Clinton B. Sears of the Corps of Engineers submitted to the Senate a report on a survey for the location of a canal to connect Lake Superior and the Mississippi River, which survey and report had been directed by legislation of a previous session. The intention of Congress was to ascertain which was the most feasible of three indicated routes, viz., by way of either the Saint Croix, Rum, or Upper Mississippi rivers. The question whether either of them was feasible, or whether the commercial benefits to be derived would justify the expenditure involved, was precluded. Consequently Major Sears confined himself to the question which of the three routes was the most feasible. The route via Allouez Bay and Brule and St. Croix rivers was recommended.

It is understood that the intention of the promoters of this undertaking was to provide for a canal from Lake Superior to St. Paul and Minneapolis, but the wording of the act authorizing the examination precluded a survey of any portion of the Mississippi as a connecting link, thus leaving the Mississippi end of the route over 300 miles from St. Anthony Falls. This of itself, however, is not important except as an element of cost.

PUGET SOUND AND LAKES UNION AND WASHINGTON CANAL.—Congress called for the report of Capt. T. W. Symons, Corps of Engineers, upon the survey of the waterway connecting the waters of Puget Sound, at Salmon Bay, with Lakes Union and Washington. The project contemplates making a fresh-water basin out of Salmon Bay, a navigable salt-water body, by raising its waters to, and maintaining them on a level with Lake Union, by means of a lock at its mouth. It also calls for a lock between Lakes Union and Washington. The general route of the proposed canal or waterway leaves Puget Sound at the mouth of Salmon Bay; traverses the entire length of this bay; thence by a cut to Lake Union; through Lake Union to the eastern extremity; finally entering Lake Washington by a cut across a narrow ridge known as the Portage. The object of the improvement is to further develop the wonderful facilities of the city of Seattle as a Pacific coast seaport, by enabling vessels of all kinds to have access to these lakes and the extensive manufacturing and commercial interests involved.

CANAL FROM THE GREAT LAKES TO NEW YORK.—The Committee on Commerce in the Senate reported favorably on the bill to incorporate the Maritime Canal of North America, which gives in effect, authority to construct and operate a ship canal from the Great Lakes to New York. The course of the canal is around Niagara Falls, thence through Lake Ontario and down the St. Lawrence to a point near the international boundary; thence to Lake Champlain, to Hudson River and the ocean. The channels must be of sufficient width and depth to allow vessels drawing twenty feet of water to pass each other with safety; the locks large enough to admit vessels 550 feet in length and 65 feet in width. The incorporators are well known transportation and business men, engineers, manufacturers and bankers, some of them of large wealth. The bill seeks no appropriation, grant or guaranty from the Government now or hereafter. The privileges sought are extensive and far reaching, because the future greatest growth and development of the country will be in the region of the Great Lakes. Hon. F. A. Flower, Secretary of the International Deep Waterways Association and the recognized head of the deep-water movement, made a highly interesting statement before the Committee, which also forms part of its report.

A clause in the River and Harbor Act of the recent session directs the Secretary of War to prepare estimates for the construction of a ship canal by the most practicable route wholly within the United States, from the Great Lakes to the navigable waters of the Hudson River, of sufficient capacity to transport the tonnage of the lakes to the sea.

NICARAGUA CANAL.—Reports were made to both Houses of Congress favoring the construction of the Nicaragua Canal. The report of the House Committee deals with the canal project from the financial and engineering standpoints, and particularly analyses the report of the Government Board appointed last year, of which Col. Ludlow was chairman. The feasibility and practicability of the construction having been admitted by the Board, the House Committee insists that the Government should aid the company in the completion of the work even if it costs over $150,000,000, on the ground that while the advantages to be derived by the United States from such corporation are untold, the risk would be practically nothing.

CHESAPEAKE AND DELAWARE BAYS CANAL.—Senator Elkins introduced a bill to provide for the construction of a canal through Maryland and Delaware to connect the waters of the Chesapeake and Delaware bays. The canal to have a depth of 30 feet, and width of 178 at the top and 100 at the bottom; locks of sufficient size to allow the passage of vessels of the largest size in use in ocean traffic. The canal when completed to be a military, naval, postal and public highway.

LAKE MICHIGAN AND WABASH RIVER CANAL.—Senator White made a favorable report on a resolution providing for the appointment of a commission of army engineers to survey and report plans, specifications and approximate estimates of the cost of construction of a ship canal from the lower shore of Lake Michigan to the Wabash River. Such a canal would afford a route from the Great Lakes to the Gulf without breaking bulk.

GROUND MAP OF THE UNITED STATES.—Favorable report was made on a proposition submitted by Mr. Cannon, of Utah, for the appointment of a commission to examine into the practicability, advisability and cost of establishing at Washington a ground map of the United States, on a scale of one square yard of map surface for each square mile of actual area, reproducing in earth and other materials, on scale, the boundaries and topography, and all the natural and artificial features of the surface, showing geographical divisions; also, mountains, hills and valleys, forests, lakes and streams, cities and villages.

To provide a map on the plan and scale proposed would require 625 acres. Upon such a map the Mississippi River with its Missouri tributary would be 4,506 yards long, and about 3 feet wide of actual water. Lake Michigan would contain 22,000 square yards of actual water surface. Mr. Cannon says he has expert testimony to the effect that neither will the cost be extravagant nor any physical difficulties in the way of the production; and that as to the advisability, there is not an hour in any working day of the year when legislators or administrative officers are not confronted by problems which could be more speedily, more justly, and more intelligently settled by reference to a map of this character.

At all events, considerable service might be rendered to the official knowledge of the country and to popular education by the work of such a commission, embodied in a report.

NAVASSA AND SWAN ISLANDS.—A resolution was under consideration in the Senate directing the Secretary of the Navy to appoint a board of three officers to proceed to Navassa and Swan islands in the West Indies to ascertain the practicability of establishing a coal station on either. These islands are said to have no anchorages, but shores like a stone wall. They are private property, and useful for fertilizing material.

METRIC SYSTEM.—An unsuccessful effort was made to fix the standard of weights and measures by the adoption of the metric system. The use of this system was made legal and permissive by an Act of Congress passed in 1866. That action did not make the system obligatory, but simply legal, permissive by anybody who desired to use it. The object of the present effort was to complete the work commenced in 1866; first, by adopting it in Government work; and then, at the commencement of the new century, to recognize it as the legal system throughout the country. In many of the Bureaus of the Government it is now in operation. In the Coast and Geodetic Survey office it has for years been practically the exclusive system. In other Bureaus it is used to a large extent. In the Post Office Department it is within the power of the Postmaster-General to have every letter weighed by the metric system; for every pound of mail matter placed in the office for transportation to foreign countries is now weighed and its transportation settled by that system.

Mr. Charles W. Stone, Representative from Pennsylvania, presented the subject forcibly in the House of Representatives; but he found it a difficult matter to convince that body that it would be quite as easy for the people to understand and to know that 30 grams make one ounce as that 20 pennyweights make one ounce. It being late in the afternoon of the day that the measure was under consideration, the House was in a mood to be entertained and easily impressed with shallow wit; which situation was taken advantage of by Mr. Otey (of Virginia), who kept the members in "laughter," "great laughter," "renewed laughter" (according to the official report) by a skilful ridicule of technical and scientific words and phrases. Mr. R. W. Parker, of New Jersey, and Mr. Franklin Bartlett, of New York, were conspicuous opponents. The effort to apply the decimal system to length, capacity and weight, as well as to coins, was delayed for a season.

PACIFIC CABLES.—In the matter of a Pacific cable, Senator Frye made a report favoring its construction and maintenance by any private corporation which shall recognize the Spalding concession, and accept a subsidy of $160,000 per year for twenty years from the United States Government, the cable to extend from San Francisco to Honolulu, and by way of the Midway Islands to such points on the coast of Japan as the company may select. It will be recalled that at the session of Congress preceding the last, the Senate by a decisive vote adopted, and the House by a large minority supported, a resolution directing the immediate construction of a line to Honolulu at the sole expense of the United States.

A bill is pending authorizing M. J. Fahey, of New Haven, and associates to construct and operate a cable and telegraph from the State of Washington to Sitka or Juneau; thence to Saint Paul on Kadiak Island; thence to Ounalaska and some point in the Aleutian group where a connection can be made with the Siberian and Japan telegraph system.

It is the purpose of a bill reported by representative W. H. Doolittle to require every company, American or foreign, to apply hereafter to Congress for permission to land or operate any submarine cable. All cables now in operation have had such permission granted by the Department of State, subject to any future action of Congress; but as a matter of fact there is no law of Congress authorizing the Department to comply with such requests. Nor would a general law on the subject be desirable, because the circumstances surrounding, and the character of each project for laying a submarine cable, are likely to be peculiar to itself.

The Hydrographic Officer has recently issued a chart of the Submarine Cables of the world, principal connecting land lines, and coaling, docking and repairing stations.

COAST SURVEY.—Not long ago the Coast Survey made an effort to secure files of all maps relating to this country, and especially of all that are published by the authority of the States or Counties. The results, as far as the latter are concerned, were very meagre. Ten States sent small railroad maps, of various scales, issued by railroad commissioners, and of but little geographical value, viz.:

Alabama, Arkansas, Maine, Michigan, Missouri, Nebraska, North Dakota, Ohio, Pennsylvania, and Virginia. Ten States and Territories replied that they had no officially authorized maps, viz.: Arizona, Delaware, Iowa, Louisiana, Montana, Nevada, Oklahoma, Texas, West Virginia, and Alaska. California and New Jersey sent two geological maps. Ohio sent a small map with geological features superimposed. Nebraska sent a statistical map. The grand total being fourteen, from forty-five States and six Territories. Seventeen States made no response whatever; among these Connecticut, Illinois, Indiana, Maryland, Massachusetts and Vermont.

A new edition (the 4th) of the Coast Survey's Formulæ and Tables for the computation of geodetic positions has appeared. It differs from the preceding one by the introduction of a change in the notation of the formulæ, substituting for the older form one better in accord with modern custom, and, further, by an extension of the tables so as to take in the highest latitude of the United States territory, besides 5° added to the former southernmost limit.

The Survey has also issued a second enlarged and revised edition of "Geographic positions of trigonometric points in Massachusetts." These positions were determined between 1843 and 1894, and include also the work of the Borden Survey of 1832 to 1858. The number of stations occupied was 1,467, of which 447 belong to the Borden survey.

The exquisite instruments used by the Coast Survey, many of which are evolutions suggested by the experience of field parties, are constructed in the shop of the Survey. An advisory board, consisting of the most valued officers of the Survey, with the chief instrument maker (Mr. E. G. Fischer), considers all important matters referring to instruments, the aim being to make them as perfect as possible, taking advantage of the experience of all surveys in this as well as foreign countries.

ALASKA, AND ARCTIC REGIONS.—The Coast Survey has given out some new information * relating to the vicinity of Cook's Inlet and region to the westward, and the vicinity of Chatham and Peril straits. The information relating to Cook's Inlet is founded on the investigations made last summer by Prof. Dall, who, in connection with Prof. Becker, made a survey of that region with special reference to coal deposits. The charts of the territory around Cook's Inlet are far from correct, but they are compiled from the

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* Bulletin No. 35.

most reliable sources. The Coast Survey is making every effort to have this valuable part of the region accurately charted.

The information covering the vicinity of Chatham and Peril straits from Point Gardner at the junction of Frederick Sound and Chatham Strait, to Povarotni Island in Peril Strait is compiled from notes made in 1895 by Commander E. K. Moore, U. S. N., commanding the Coast Survey steamer *Patterson*. It is very general in its character, and preliminary to the charts and sailing directions which will be published in the near future. Still, the notes are a valuable addition to the scant information already existing in print on this part of Alaska.

The new map of the Arctic regions, with tracks of search parties and the progress of discovery (40 x 40 inches), published by the U. S. Hydrographic Office, delineates the routes of all the explorations of the coasts since 1734. Forty-eight expeditions are indicated, and, in addition, the tracks of seventy-six parties. These tracks are represented in varied colors. Twenty explorations, or nearly half the total, are credited to Russia; nineteen to Great Britain; six to the United States; one to Austro-Hungary; one to Germany, and one to Norway.

The extent of trackage displayed on the European-Asiatic side of the chart, especially in the regions of the Russian possessions, is somewhat surprising. The numerous soundings indicated leave very little room for uncertain navigation. The most interesting study is on the American side of the chart. Here we have a comprehensive and graphic representation of the extensive routes taken by Parry, Franklin (probable), McClure, Collinson, Grinnell expedition, Kane and Hayes, McClintock, Nordenskiöld, DeLong, Lockwood and Brainard, and Peary, and others of less extent. The whole display is a most skilful representation of the progress of discovery and of our present knowledge of the Arctic regions. As nothing like it has been published heretofore, all educators and those interested in Arctic discoveries will appreciate the work of Commander C. D. Sigsbee, under whose direction, as U. S. Hydrographer, this important information has been made available.

The investigation of the gold and coal resources of Alaska commenced last year by Prof. Dall and Prof. Becker will be continued this year by Mr. J. E. Spurr and associates under direction of the Geological Survey. The examination will extend to the Upper Yukon region. The party will not return at the end of the season, but remain through the winter months, continuing the examination through the season of 1897. Prof. Becker, one of the best gold mine experts in the world, is on an extended leave of absence, and is now engaged in the gold fields of South Africa under liberal arrangements with interested parties.

GEOLOGICAL SURVEY.—The work of surveying the Indian Territory, begun last summer and continued with only a few days' interruption since, is keeping a large force at work. A number of geological and topographical parties have resumed operations in other parts of the country. The appropriations available for the use of the Survey during the season of 1896–97, including the Indian Territory survey, aggregate $736,590.

Mr. Henry Gannett, the Geographer of the Survey, is giving attention to original inquiry on the subject of magnetics, and will during the year prepare several reports on this topic and others connected with physical geography. The work hitherto in charge of Mr. Gannett has been divided. He will hereafter devote himself exclusively to geographical work; the administration of the topographical branch will be under the immediate charge of Mr. Walcott, the Director.

FORESTRY.—The Commission organized by invitation of the Secretary of the Interior with the approval of Congress, for the purpose of making an investigation of various forestry problems, will proceed to Montana in July. From thence the tour will be extended through Idaho, Oregon, Washington, California, Arizona, New Mexico and Colorado.

The Secretary has requested an opinion upon the following points:

1. Is it desirable and practicable to preserve from fire and to maintain permanently as forestry lands those portions of the public domain now bearing wood growth for the supply of timber?

2. How far does the influence of forest upon climatic soil and water conditions make desirable a policy of forest conservation in regions where the public domain is principally situated?

3. What special legislation should be enacted to remedy the evils now existing?

Those composing the Commission are Charles S. Sargent, Alexander Agassiz, Henry L. Abbott, William H. Brewer, Arnold Hague and Gifford Pinchot. Prof. Wolcott Gibbs, President of the National Academy of Sciences, is an *ex-officio* member. Several preliminary meetings have been held. The Commission will return late in the autumn, and as soon as possible thereafter submit its report.

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MAP NOTICES.

Topographic Atlas of the United States.

Since our last notice the U. S. Geological Survey has issued 20 additional sheets. Of these one only, Ticonderoga, is in New York. This is a beautiful sheet, embracing parts of Lakes George and Champlain—a historic region.

In Pennsylvania are two sheets, Norristown and Chester, lying just west of Philadelphia, and containing a large suburban population. These two sheets, with the Philadelphia and Germantown sheets, are to be printed as one map, showing Philadelphia and its environs.

In Georgia is one sheet, Monroe, lying east of Atlanta, in the Piedmont region.

The Dakotas receive special attention in this issue. In North Dakota are four sheets, viz.: Edgeley, Columbia, Jamestown and Lamoure. The last three are in the James River valley and show slight relief, except the little irregularities due to deposits from the continental glacier. On the western part of the Edgeley sheet, however, appears the eastern margin of the Coteau du Missouri, or the "Hills," as locally known. This Coteau, as is well known, is a long tongue of glacial deposits, stretching from Canada down across the Dakotas, between the Missouri and James rivers. On the Edgeley sheet, its bluff edge rises 200 to 300 feet above the James River valley. Its surface is extremely irregular, being a succession of rounded gravel hills, interspersed with ponds, most of which have no outlets. The region is devoid of timber.

In South Dakota there are two sheets, Byron and Aberdeen, both in the level valley of James River.

In southwestern Kansas there is one sheet, Garden, representing the Sand Hill country of that region, a country without order or system, built up from drifting sands.

In western Texas are two sheets, Alpine and Chispa, each representing about 1,000 square miles of broad, flat valleys, intersected by trachyte mountain ranges, irregular in character.

In Wyoming are four sheets. Two of these, Ishawooa and Crandall Creek, are just east of the Yellowstone National Park, and include a large area of the most rugged portion of the Absaroka range. A third, Dayton, includes the head of Tongue River and a part of the Bighorn Range, until recently an unknown region. The fourth, Laramie, shows a part of the great Laramie Plains.

The San Francisco peninsula is represented on two sheets, San Francisco, which includes the city, and San Mateo, lying just south of it.

Crater Lake, Oregon, is made the subject of a special sheet, on the scale of 1:62,500. This lake, five or six miles in diameter, occupies a crater-shaped depression on the summit of a truncated mountain. The top of the mountain has either been blown out or has sunken. The lake is roughly circular in form, surrounded by cliffs 1,500 to 2,000 feet in height, and has no outlet, and practically no drainage basin, beyond its own area.

A Map of the United States showing the Distribution of Lands. By F. H. Newell.

This map accompanies a report on the Public Lands and Their Water Supply, by Mr. Newell, which forms a part of the Sixteenth Annual Report of the U. S. Geological Survey.

The map shows, by a series of colors, (*a*) The area included in the thirteen original States, with those formed from them, and Texas, in which states the United States has never owned any land. (*b*) Areas which, while formerly held by the United States, have passed into private ownership. (*c*) Land grants to railroads. (*d*) Indian reservations. (*e*) Forest reserves.

The most interesting feature of this valuable map consists in the areas which have been alienated by the Government to private parties. In the Central States nearly all, and in many of them all, the lands have been alienated. The trifling areas still held by the Government in the Gulf and Lake States are scattered in small bodies over those states. In Minnesota there are still considerable areas near the northern boundary held by the Government. In the Dakotas, west of the Missouri River, there are large areas of land still unoccupied. Indeed, most of the northern half of North Dakota is still Government land. In the western part of Oklahoma there are still large areas unoccupied. In the Western States, east of the Cascades and the Sierra, the occupied areas are in the small tracts quite generally scattered over the country and much the larger portion of the land is as yet unoccupied. In eastern Washington there is a large occupied tract, while the entire valley west of the Cascades and the Sierra, from the northern boundary to southern California, is almost entirely taken up. So it is with the strip along the Pacific Coast west of and among the Coast Ranges.

The dependence of settlement upon water in the arid West is forcibly shown by the location of the settlements, which are found in all cases scattered along the streams.

This report is accompanied by another map which also deserves notice. It is entitled, "The Relative Location of Forests, Woodlands and Irrigated Areas in the Western Part of the United States." Upon this map forests, by which is evidently to be understood areas of woodland, which are of merchantable character, are represented in green, while other woodland areas, such as mesquite, piñon pine, cedar, and quaking aspen, are distinguished from them by a drab color. Irrigated areas are represented in red.

Although highly generalized, being on a scale of 200 miles to an inch, this is doubtless by far the best map showing the distribution of woodlands in the western part of the country, since it represents the accumulation of a vast amount of data. It will doubtless surprise many readers to see the large extent of forests in Arizona, New Mexico, Colorado and Utah, which States are popularly supposed to be devoid of forests of value.

"*Outline Map of the United States and Territories. Prepared in the Office of the Chief of Engineers, U. S. A., Under the Direction of Major H. M. Adams, Corps of Engineers, U. S. A. Showing the Tonnage of the Navigable Rivers of the United States. Compiled from Annual Reports, for 1894 and previous Years. Scale 50 miles to one inch.*"

This map shows graphically, by the breadth of the bands of color, the navigable rivers, and the freight tonnage which was borne upon these rivers in the year 1894. It forms a most graphic summary of our internal commerce upon our rivers.

The heaviest commerce regarded upon this map is that through the Detroit River from Lake Huron to Lake Erie. Most of this comes from Lake Superior, as is shown by the large volume which passes through St. Mary's River, and nearly all of it is dropped at ports upon Lake Erie, mainly at Buffalo, as is shown by the greatly decreased volume which passes the Niagara River and also by the large volume which comes down the Hudson.

Of the freight upon the main rivers of the United States, that upon the Ohio is much the heaviest, greatly exceeding that on the Lower Mississippi. This is explainable by the movement of coal from the neighborhood of Pittsburg to Ohio River points and to St. Louis. We are surprised to see that, while there is considerable freight movement up the Missouri River as far as Great Falls, Montana and up the Arkansas far into Kansas, there is no movement upon the Yellowstone River, upon the Rio Grande, or upon the Colorado; at least none of magnitude to warrant representation upon a map.

Among the many interesting features which this map develops may be mentioned the course of the fall line from Trenton southward and westward to Montgomery, Alabama, which is here outlined clearly and unmistakably by the extent of navigability of streams.

We are not aware that this method of representing commercial movements has been used in statistical illustration in this country before, and Major Adams is to be congratulated upon his success in applying this method of representation.

Topographical Map of Blue Hills Reservation. Topographical Map of Middlesex Fells.

The scale of the above maps is 1:6,000, or 500 feet to an inch. Relief is expressed by contour lines, with five-foot intervals. Maps are published by photolithography, the year of publication being 1895.

These maps are made from original surveys, under contract with the Metropolitan Park Commission, of Boston, by Messrs. French, Bryant & Taylor. They appear to be most excellent maps and are well worthy of extended notice. The area of these maps was first controlled by triangulation. As required by the specifications, lines were then run by stadia at intervals of two miles in both directions across the areas, along which lines heights as well as distances were measured, and at their intersections stone monuments were set. The filling in of details was done by plane table. The contours were located, in the main, by interpolation between measured heights. In a few cases, especially in the more level country, contour lines were followed.

The original maps were drawn upon a scale of 100 feet to an inch, the published maps, therefore, being a reduction to one-fifth the scale of the original drawing.

The contract price at which the work was done was $1.50 per acre, or about $1,000 per square mile.

Service Géographique des Colonies. Congo Français. Carte dressée à l'Echelle de 1:1,500,000 par J. Hansen, Cartographe du Congo Français, Paris, 1895.

This is in two sheets, on a scale of about 25 miles to an inch. It has been compiled from surveys made between 1867 and 1895, by nearly a hundred different explorers. It gives the course of the Congo and its main branches on the north within French territory, in considerable detail, but there still remain interspaces of many thousands of square miles which are as yet untrodden by civilized man.

An annexed map shows the region about the mouth of the Congo, and a second annexed map, on a much smaller scale, 1:5,250,000, about 83 miles to an inch, presents the region between Lake Chad and the Nile, *i. e.*, the Western Sudan.

The map shows little besides culture and drainage, relief being but faintly expressed.

A pamphlet describing the sources of information used in the preparation of the map, and containing also an alphabetical index of all names found on the map, accompanies it.

Carte de l'État Indépendant du Congo. Dressée d'après les Itinéraires originaux des Agents de l'État et d'autres voyageurs par J. Du Fief, Secrétaire Général de la Société Royale Belge de Géographie. Echelle 1:2,000,000. 20 Juillet, 1895.

This map, in four sheets, on a scale of about 32 miles to an inch, illustrates, when placed in comparison with those of earlier date, the extreme rapidity with which this dark spot on the face of the earth is becoming illuminated. Half a generation ago this entire area of the Congo Free State was a *terra incognita*, a blank upon the maps. Now there is not an area on this map as large as the hand which is unknown, which has not been penetrated by explorers, while most of the map is a perfect network of lines of exploration.

The progress of the State in establishing stations and thereby obtaining control over the territory has kept pace with its exploration. Hundreds of stations are now maintained, not only along the course of the Congo, but on all its principal tributaries, while many are located in the interior, away from water transportation. One of the most impressive features brought out by the map is the line of stations on the Aruwimi, upon which stream Stanley toiled but a few short years ago.

Mapa Cadastral Gráfico de la Provincia de Corrientes, República Argentina, construido con los datos oficiales por el Agrimensor Zacarias Sanchez, 1893. Scale 1:40,000.

This map, complete in sixteen sheets, shows primarily property lines, as is indicated by its title. It is more, however, than a mere cadastral diagram, since it represents all cultural and physical features, except relief, in considerable detail.

Schizzo del Teatro della Guerra Italo-Abissina. Edito dall Istituto Cartografico Italiano. Roma, Marzo, 1896. Scala di 1:333,000.

This map, on a scale of about five miles to one inch, represents an area of some 450 square miles in northern Abyssinia, comprising the region in which the Italian soldiers recently received such a crushing defeat at the hands of the Abyssinian forces.

The map represents routes and streams in considerable detail. Relief is expressed by brush shading, and the mountainous nature of the country is well developed. It is an ideal region for defensive warfare, especially by active, aggressive warriors, such as the Abyssinians.

Mappe of the Principal Voyages and Discoveries made by the Hollanders, with the principal Lands, Places and Factories in their possession. Brought together by Mr. Anton Mensing, Published by the Committee for Old Holland, at Amsterdamme, 1895.

This is an outline map of the earth, on Mercator's projection, in imitation of the maps of the 15th century, showing the routes of Dutch navigators and discoveries made by them in the days when the world was young.

A study of this map shows that the Dutch, at that time one of the leading commercial nations, played no mean part in exploration. In developing our knowledge of the East Indies they were probably the most prominent of all nations, while to our acquaintance with the coasts of Africa and South America they contributed a considerable share.

The borders of the map are embellished with landscapes and symbolic cuts, as was the fashion three or four centuries ago.

Neue Special-Karte der Südafrikanischen (Transvaal) Republik, des Oranje Freistaats und der Angrenzenden Gebiete. Massstab 1:3,000,000 Nach Afrikanischen, Englischen, Deutschen, Holländischen, Portugiesischen und Französischen Quellen bearbeitet von A. Herrich. Glogau, Verlag von Carl Flemming.

The interest aroused all over the world by Dr. Jameson's raid, and the resulting European and South African complications, make this map of the greatest interest.

Plano General del Camino Central del Perú del Callao al Ucayali, siguiendo las vias de La Oroya, Chanchamayo y El Pichis, por J. Capelo, 1895. Escala de 1:1,000,000.

This map represents, in some detail, a section across the Andes from Callao to the head of navigation on the Ucayali, a branch of the Amazon. From Callao to Oroya this route is traversed by the railway, thence to Bermudez, on the Pichis, by a wagon road.

A profile accompanies the map, from which it appears that the greatest elevation on the route is 4,950 metres, about 16,000 feet, at the summit of the Cordillera, on the railroad. The terminus of the road, Bermudez, on Amazon waters, is at an elevation of about 700 feet.

Carta Stradale ed Industriale delle Provincie di Macerata,—di Massa e Carrara,—di Ascoli Piceno. Scala 1:500,000. Istituto Cartográfico Italiano-Roma.

These three little maps evidently form part of a series, published by the Direzione Generale della Statistica, illustrating the distribution of population and industries of Italy. The population and the prevalent industries of places are indicated by conventional signs.

Provincia de Angola. Carta dos districtos de Benguella, e Mossamedes, 1895. Escala 1:1,000,000. Commissão de Cartographia, Lisboa.

This map, in four sheets, represents, on a scale of about 16 miles to an inch, most of the Portuguese possessions in West Africa. Streams are printed in blue, those which have been explored being in full lines, and those whose course is hypothetical being dotted, and it is surprising to note how large a proportion of this country has been explored. Relief is shown by brown hachures.

Commissão de Cartographia, Lisboa. Costa Oriental de Moçambique. Reconhecimento hydrographico da Barra do Rio Licungo (M'Gondo). Escala 1:10,000, 1895.

Photolith.

Chart of the entrance to the Licungo, in the Portuguese possessions in southeast Africa.

Carta del Teatro della Guerra Nel Sudan Egiziano, tratta dalle migliori e più recenti carte militari inglesi per cura dell'Istituto Cartografico Italiano. Scala, 1:2,000,000. Aprile, 1896.

This map, on a scale of about 32 miles to an inch, represents the scene of the recent disastrous military operations of the Italian army. It shows the country from the latitude of Suakin on the north down to 9° north, and from the Red Sea westward to the Nile, at Wadi Halfa, thus including much of Abyssinia and the Eastern Sudan. Relief is expressed by crayon shading.

The region here shown may become the theatre of important events in the near future.

The Arctic Regions, with tracks of search parties and the progress of discovery, U. S. Hydrographic Office, 1896. Polar projection extending south to latitude 63°.

Routes of exploration are shown by lines of different kinds and colors, no fewer than 76 expeditions being thus distinguished. Colored bands along the coast indicate the source of original information regarding them.

It is a very comprehensive map, illustrating in the tersest way the progress of Arctic exploration. It would have been an improvement if the same color of lines and bands had been used for expeditions of a certain nationality, or for expeditions between certain dates, so that classifications of the work would be apparent.

BOOK NOTICES.

The Geographical Society of the Pacific. An Examination into the Genuineness of the "Jeannette" Relics. Some Evidences of Currents in the Polar Regions. Report of the Special Committee appointed by the Council to Report upon the "Jeannette" Relics. 8vo. San Francisco, 1896.

This examination and report were made necessary by Prof. W. H. Dall's statement * that the *Jeannette* relics were not genuine, but the result of a trick played by some persons of the U. S. Greely Relief Expeditions of 1883 and 1884.

The relics in question were found on an ice-floe on the 18th of June, 1884, not far from Julianehaab, in South Greenland. The *Jeannette* sank near the New Siberian Islands on the 13th of June, 1881.

In August, 1884, the Danish Consul of New York received the following official communication:

> THE COLONY JULIANEHAAB, in South Greenland, June 23d, 1884.
>
> To the Consul for Denmark, at New York:
>
> I hereby take the liberty to request the Consulate to inform the editors of the *New York Herald*, that on the 18th inst. three Greenlanders picked up on an ice-floe some effects and some partly-torn papers belonging to the American Arctic Expedition, among which are the following:
>
> 1.—Two end pieces of a wooden box, on which are written with lead pencil—on one piece—
>
> *General Orders.*
> *Telegrams.*
> *Sailing Orders.*
> *Ship's Papers.*
> *Various Agreements.*
> *Charter Party.*
>
> the last words are not very plain.
>
> 2.—On the other piece was—
>
> *Before Sailing.*
>
> 3.—A torn check book. On the back of one of the checks is printed, "For Deposit with the Bank of California."
>
> 4.—A pair of oilskin trousers, marked "Louis Noros."

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* Fully set forth in a paper in *The National Geographic Magazine* for March, 1896, pp. 93–98.

These effects, numbering twenty-one pieces (besides the papers), are in my possession. I am going home to remain during the winter. Should anybody want further information the same can obtain it by addressing—

KOLONIBESTYRER C. LYTZEN,
Kongl. Grönl. Handels-Kontor,
Kjöbenhavn, K., Denmark.

Respectfully,
CARL LYTZEN.

These relics were placed in the hands of a member of the Danish Geographical Society, at Copenhagen, for safe keeping. The custodian died, his house was taken by another owner, and the relics disappeared.

Prof. Dall's strongest point is that Dr. Emil Bessels, in 1885, interviewed a number of the seamen and officers of the Relief expedition, and made notes of his examinations to the extent of forty or fifty pages of foolscap. The testimony of these seamen was, in brief, to the effect that the presence of *Jeannette* survivors in the Relief expedition had suggested the possibility of the hoax, which was carried out with no intention of serious deception. No names were mentioned and no particular man was personally cognizant of the act.

On one or two occasions Prof. Dall was invited to be present when some of the seamen called on Dr. Bessels. The notes taken by Dr. Bessels were burned with his house at Glendale, D. C., and he himself died in Germany in the year 1888. It does not appear that the notes were ever copied.

Prof. Dall says that his opinion as to the character of the relics was asked and made known to Dr. Nansen before his departure on the voyage from which he has not yet returned.

The Committee appointed by the Geographical Society of the Pacific ask, very properly, why neither Dr. Bessels nor Prof. Dall ever informed the Government of the seamen's testimony concerning the fictitious character of the relics.

The recorded drifts of vessels and trees and other material to the Greenland coast must be held, the Committee argue, to establish the existence of the Arctic currents which brought the *Jeannette* relics to Julianehaab.

The story of the hoax is rejected, as improbable in itself, and as constituting a reproach to the officers of the United States Navy.

With the return of Dr. Nansen it cannot fail to become known how far he was influenced in the formation of his plans by his belief in the genuineness of the *Jeannette* relics and their drift through the Arctic Ocean; but the main question will be left without a definite answer, though it must be said that the facts, so far as known, and the probabilities support the Committee in their position.

Through Jungle and Desert. Travels in Eastern Africa. By William Astor Chanler, A.M. (Harv.), F.R.G.S., Honorary Member of the Imperial and Royal Geographical Society of Vienna. With Illustrations from Photographs taken by the Author, and Maps.

> "*When I travelled I saw many things ; and I understand more than I can express.*"—ECCLESIASTICUS, *xxxiv. 11.*

8vo. New York, Macmillan & Co. London : Macmillan & Co., Ltd. 1896.

This volume is the record of two years' work in East Africa, undertaken for the purpose of adding something to the world's knowledge of the country lying between the Tana and Juba rivers. Mr. Chanler had some previous experience of African travel, and his companion, Lieut. von Höhnel, was with Count Teleki on the expedition which resulted in the discovery of Lakes Rudolf and Stephanie. The plan of campaign was to ascend the Tana River to the limit of navigation, and from that to push as far as possible into the interior to the country of the Rendile, a tribe supposed to range between Lake Stephanie on the north and Mt. Kenia on the south, and reported to be rich in flocks and herds. From these people, if he found them, Mr. Chanler hoped to purchase fresh pack-animals and then to continue his explorations.

This plan was carried out, so far as the Rendile were concerned. They were encountered at a point about 100 miles to the northeast of Mt. Kenia. They are described as a tall, thin race, reddish brown in color, with soft, straight, closely cropped hair, regular and almost Caucasian features and fierce blue eyes. Their arms were bows and arrows and spears, and they seemed to be able to defend themselves against their predatory neighbors. The original home of the tribe was the district between the General Matthews Range and Lake Rudolf.

Each Rendile village is governed by a chief, who is elected by his fellows. Polygamy prevails, and with it primogeniture, though substantial presents are given to the brothers of the heir, who also assumes the care of his mother and sisters. When the sisters are married the goods paid for them become the property of the head of the family.

When a man dies the body is shaved and buried in a sitting posture in a deep hole. The hole is then filled with stones, piled several feet above the ground so as to form a cairn, in the middle of which a spear is fixed in an upright position. The kindred of the dead man then kill a camel and make a feast for their friends. The whole village goes into mourning, and while this lasts ornaments are removed, or if worn, covered with skins.

The food of the Rendile is milk, meat, blood and the fruit of the doum palm. They eat no game but the giraffe and the antelope, and these they hunt on horseback.

It was not long after leaving the Rendile encampment that Lieut. von Höhnel, while engaged in hunting, was charged and seriously hurt by a rhinoceros. This accident practically put an end to the work of the expedition. Lieut. von Höhnel was carried in a litter down to the coast, and Mr. Chanler, left to struggle with failing health, and seeing his caravan melt away by daily desertions, found himself obliged before long, to follow his disabled companion.

Mr. Chanler has described at length the composition of his caravan and the incidents of the long journey from the arrival at Zanzibar to the parting with his Somali and Sudanese at Aden. The scale is somewhat too large for the achievements, but the picture is interesting and animated. The monotony of palavers with native great men was varied by an occasional fight, and by seizing every opportunity for bagging game, quite as much for the sake of sport as to procure food. Mr. Chanler believes in sport. He says, on page 76:

> It is not for sport alone that one shoots in that country; though it is safe to state that the desire to slay is generally present in every fully developed and vigorous man.

If this means that the lower instincts exist in the natural man, it is a commonplace; but if it means that the desire to slay is a distinctive mark of manliness, it is a mistake. Were it otherwise, the accepted type of fully developed and vigorous manhood would be the butcher.

Besides the Rendile, Mr. Chanler discovered the Chanler Falls on the Guaso Nyiro River, a new species of antelope, the *Cervicapra Chanleri*, and a number of new insects. The collections made by himself and Lieut. von Höhnel are now in the National Museum at Washington.

The numerous illustrations are of no great merit, but the maps are fine specimens of skilled workmanship.

Mr. Chanler dedicates his book to Judge Charles P. Daly, President of the American Geographical Society.

Leçons de Géographie Physique, par Albert de Lapparent, professeur à l'École Libre de Hautes Études, ancien Président de la Commission Centrale de la Société de Géographie. Ouvrage Contenant 117 figures dans le texte et une planche en couleurs. Masson et Cie., Éditeurs Libraires de l'Académie de Médecine, 120 Boulevard Saint-Germain, Paris, 1896. 8vo.

This book does not pretend to be a *Treatise* on physical geography. It is to be regarded, in the author's words, as a kind of bridge between the two sciences, geography and geology, including of the latter only what seems strictly necessary and never omitting from the study of the present forms the consideration of the past which has produced them.

An alternative title suggested is: *Lessons on the Genesis of Geographical Forms*, and M. de Lapparent admits that, if he had been writing in America, he would not have hesitated to adopt the word *geomorphogeny*, which first saw the light in this country. Correctly formed as the word is and useful as it may be, there are many among M. de Lapparent's readers who will not regret its absence from the lucid pages to which the new vocabulary has contributed a part of its luxuriant growth.

In the first fifteen lessons M. de Lapparent discusses the definition of the subject, the figure and dimensions of the earth, the relief of its crust, the general conditions and the special forces which have fashioned the surface and the forms, the cycles of erosion, the action of the ice, the winds, and the waters of the ocean, and the incomplete palæographical record, not less difficult to read than a book which has lost the greater part of its leaves.

The physical constitution of Europe is explained in five lessons. Then follow, in succession, the Mediterranean region from Italy east to the Caspian, and south to the Atlas Chain, the little-known Asiatic lands, the Indo-African platforms, North America, Central America and the Antilles, South America, and the Polar Regions.

This rapid sketch of the globe embodies the results of the latest investigations and is drawn with the sure hand of a master.

The illustrations could not well be improved.

The Continent of America, Its Discovery and Its Baptism. An Essay on the Nomenclature of the Old Continents. A Critical and Bibliographical Inquiry into the Naming of America and into the Cosmography of the New World; together with an Attempt to establish the Landfall of Columbus on Watling Island, and the subsequent Discoveries and Explorations on the Main Land by Americus Vespucius.

By John Boyd Thacher. 4to. New York, William Evarts Benjamin, 1896.

Mr. Thacher says in his Preface:

> The chief purpose of this book is to establish the time and place of the naming of America. Baptism suggests birth, and the naming of America leads us back to its discovery. To speak of Vespucius is to tell of Columbus, and we have thus been persuaded by the association and sequence of important events to follow the first voyage of Columbus, the discoverer, and the first voyage of Vespucius, the explorer, and to determine with some degree of certainty the landfall of each.

Mr. Thacher has performed a labour of love in following the discoverer and the explorer, but it does not appear that he has added anything to what was already known about them, although he formally marks at the end of each chapter the stage of progress in the recital of an old, familiar story. Something more than this was to be expected of a writer who introduces us, in his title-page, to the *Cosmography* of the New World; but

> Oft expectation fails, and most oft there
> Where most it promises.

Style redeems all shortcomings, but our author has not the magic gift of style. Columbus is for him (p. 7) one of the few giant figures of the world, standing to-day as he will stand forever, great, grand, colossal.

Mr. Thacher hopes (p. 19) that he has prepared the way for self-congratulation in the hearts of Americans, since, not only do they know for whom their world is called, but the very day and hour of its baptismal ceremony, and he pushes sentimentality beyond bounds when he takes leave of Vespucius (pp. 256–257):

> And now we leave the reader at the door of the temple in which, close to the statue of Columbus, we have seen that of Vespucius firmly established. . . . Under our eyes the story of his travels has come to the little mountain town in Lorraine, and we have heard in that quiet spot the solemn words of baptism with which the *novus mundus* was given his name. . . . We have seen in this book of Ortelius the acceptance of the New World into the sisterhood of four continents, a co-heiress to the glory of the earth. Not in all these things have we had one unworthy thought of Americus Vespucius. Having followed him not afar off, but hand in hand, we feel we know something of him and of his work, and as Columbus, his friend, commended him to his son Diego, so we can confidently and with honest praise commend him to you, O reader, and to the world.

The illustrations and maps in this stately volume are satisfactory reproductions. They include some not previously accessible and a few pictures of St. Dié, the Baptismal Font of America, as Mr. Thacher is pleased to call it.

The book is printed by the DeVinne Press, and it would be difficult to produce in any part of the world a more beautiful specimen of work.

Observations Météorologiques sur les Pluies Générales et les Tempêtes. Nouvelle Edition par Gaston Féral. Montauban, 1896.

In this pamphlet M. Féral describes an electro-magnetic phenomenon observed under the following conditions:

> On the 10th of June, 1893, at the village of Puicelcy, arrondissement of Gaillac, we saw in clear weather at six o'clock in the evening, clouds rising on the horizon to the northeast, greenish yellow in their upper part and of a clear, bright red below. They showed themselves at first in circles on the same horizontal line, filling a broad space and rising not quite half the distance to the zenith. Then the circles disappeared and with them the colour of the upper part, and the clouds took a shape resembling a broad horizontal band coloured more or less deeply red. Two hours after their appearance they were no longer to be distinguished. The weather remained fine during the 11th, 12th and 13th of June, with some cirrus clouds, and a south wind.
>
> On the morning of the 14th the sky was overcast, and at one o'clock the rain fell, the wind blowing from the west. It rained, with intermissions, for two and a half days, and the meteorological bulletins showed that the rain had been general.
>
> According to this there exist one or several atmospheric phenomena which show themselves about 91 hours in advance in the districts in which begins the gathering of heavy rains. We have not observed the phenomenon in the winter.

M. Féral concludes that he has made the discovery of an electro-magnetic phenomenon *sui generis*, which may be regarded as a transition between the polar aurora and the electrical discharge of a storm, and he enlarges upon the value of the discovery to the farmer and the cultivator. These persons, it is to be feared, will continue to prefer their own time-honoured science of the weather, when they read M. Féral's admission (on p. 12) that they cannot expect to see his phenomenon more than once a year.

The New Geography. By Albert Perry Brigham. (Reprint), 8vo, 1896.

Prof. Brigham's paper considers the claim of the new geography to a place in the scheme of higher education. It offers, we are told, multiplied sources of intellectual satisfaction and ennobling means of recreation and culture, and it illumines historic and economic research at every turn. This is not too much to say, but Prof. Brigham finds, on comparing the catalogues of fifty American colleges and universities, that thirty-three of these documents afford no reason to suppose that geography receives systematic attention in their respective institutions. Of the remaining seventeen Harvard and Chicago give the fullest measure of instruction and wholly of the most progressive type; Yale has two courses in physical geography, Princeton two, Cornell one, and Michigan teaches the development of topography under geology. Physiography is taught in Vassar, Hamilton, Rochester, Wesleyan, and North Carolina. Leland Stanford, Jr., has a course in topographic geology, and Oberlin a course in quaternary geology. At Amherst the subject is briefly treated with historical geology and at Colgate seminary and field courses are given in the history of topography and in glacial geology.

Prof. Brigham quotes with approval the statement that

> systematic study of topography is largely American, and for the reason that the broad object lessons of the Appalachians and of the West gave our scholars the opportunity and the stimulus to lead in such researches.

The statement may or may not be correct, but the reason assigned for it will not bear examination. America is not the only country which offers broad object lessons in topography.

Annuaire Géologique et Minéralogique de la Russie, rédigé par N. Krichtafovitch, Vol. I, livr. I (première moitié). 4to. Varsovie, 1896.

This is the French title of a publication in two languages (Russian and French, or Russian and German), issued as an experiment by the editor, who resides at Novo-Alexandria (Government of Lublin) and has his printing done at Warsaw.

The purpose of the *Annuaire* is to furnish a clear and concise account of every new work on the geology and mineralogy of Russia. The volume for 1896 will consist of about 480 pages, and the second section will be exclusively dedicated to the literature of 1895. Besides notices of 182 books and articles, the present number contains memoirs and original notes and news of scientific expeditions and journeys.

The subscription to the *Annuaire* for 1896 (2 livraisons) is, for the countries of the Postal Union, 12 francs.

Staten Island Names. Ye Olde Names and Nicknames. By William T. Davis, with Maps by Charles W. Leng. Published by the Natural Science Association, New Brighton, Staten Island, N. Y. Price Fifty Cents. The Standard Press: New Brighton, N. Y., 1896. 8vo.

The object of this publication is to record the once well-known names of Staten Island, now mostly forgotten.

The list is not supposed to be complete, though the author has searched through many documents and has gathered information from the inhabitants in his rambles through the island. Even if incomplete, such a work is useful, and the *Natural Science Association* have done well to print it.

The arrangement is by subjects: *Points and Coves*, *Necks*, etc., but without regard to alphabetical order, so that in consulting the book every entry in a particular section must be read. The Dutch names are less numerous than might be expected, though some forms, apparently English, are no doubt corruptions or translations of Dutch originals.

In many cases Mr. Davis has given the history, or what is locally accepted as the history, of the names.

In the map, which is on the scale of 1¾ inches to the mile, the old and the new names of places are printed side by side.

L'Heure Décimale et la Division de la Circonférence. Par Henri de Sarrauton. Oran, 1896. (*Société de Géographie et d'Archéologie de la Province d'Oran.*)

M. de Sarrauton calls attention, at the beginning of his scientific paper, to this shocking anomaly: Time is measured by hours, which belong to the duodecimal system; by minutes and seconds, which are sexagesimal; and by decimal sub-multiples of the second, the use of the thirds having been abandoned.

The division of the circumference into 360 degrees presents the same inconveniences.

The author recognizes the fact that the decimal numeration is not by any means the best that can be employed, and that two others, at least, are to be preferred to it; the duodecimal, with 12 for its base, and the sexadecimal, with 16 for a base.

He admits the possibility that, in four or five centuries, the decimal numeration may give way to the duodecimal, and that this in its turn, if humanity continues its progressive evolution, may in four or five thousand years give way to the sexadecimal. For the present, however, the decimal system is in force, and the problem is how to extend it to the measurement of time and of angles.

The division of the day into 24 hours antedates history and prevails over all the earth. A day of 20 hours, or one of 10 hours, is not to be thought of, though the latter, employed by Laplace in his *Mécanique Céleste*, was actually ordained by a decree of the National Convention.

M. de Sarrauton establishes two premises:

1.—We are obliged to accept the decimal numeration, although it is not the best possible, because it is admitted throughout the world.

2.—And we are obliged to accept the division of the day into 24 hours for the same reason, and also for another, because it is excellent.

It follows that, in order to apply the decimal system to time, the hour must be taken as the unit, divided into 100 minutes, and each minute divided into 100 seconds. The hours would be counted, in this rearrangement, from 1 to 24.

As regards the measurement of angles, M. de Sarrauton would simplify it, after analyzing the two divisions of the circumference now in use (that of 360 degrees and that of 400 degrees), by the division into 240 degrees. This reform, so far as the purposes of the navigator and the geographer are concerned, may be regarded as perfect. The taking of the longitude becomes a simple matter, as this example shows:

> The longitude of Gorée, in time, west of Paris, is 1h. 17m. 59s. Translated into decimal time, this becomes $1^{h}.299,721$. Multiplied by 10, it gives 12°.9572, the longitude of Gorée in the division into 240 degrees.

The Oran Geographical Society has adopted the conclusions of this logical paper and invites the cöperation of other geographical societies in advocating the proposed reform.

La Découverte du Pôle Nord. Par Eugène Payart. (Extrait des Comptes-rendus du Sixième Congrès International de Géographie tenu à Londres en Juillet, 1895.) Reprint.

M. Payart's plan, evolved from long study of the history and the conditions of Arctic exploration, recommends itself by its simplicity and its international character. It contemplates the despatch of simultaneous expeditions through two consecutive years, from several nearly equidistant points of a circle, towards the north pole as a centre.

These expeditious to be supported by international contributions.

The farther north they went, the nearer would the exploring parties be to each other for support, in case of need, the distance between the meridians decreasing with the approach to the pole. This distance, which in 75° latitude is 15.5 geog. miles, is only 10.4 miles in latitude 80°, 5.2 miles in latitude 85°, and 3.1 miles in 87° latitude.

M. Payart indicates the following points of departure:
Jan Mayen, or the northern coast of Norway.
Kara Strait, or the mouth of the Petchora or Yenisei.
The mouth of the Lena.
Wrangel Land, or Bering Strait.
Cape Bathurst, or the mouth of the Mackenzie.
A port in Baffin's Bay, on the coast of Greenland.

Six expeditions—one for each point—are proposed, as follows;

A Scandinavian.

An Anglo-Canadian.

An American.

A Russo-Siberian.

A Germanic (Germany, Austria-Hungary and the Netherlands.)

A Western, or Latin (Belgium, France, Portugal, Spain and Italy).

The starting points to be united with the established telegraphic systems, so as to maintain communication with each other and with the world.

The estimated expense of this plan for each expedition is $2,000,000—not including the telegraphic extension.

ACCESSIONS TO THE LIBRARY.

APRIL–JUNE, 1896.

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TRANSACTIONS OF THE SOCIETY.

April, 1896.

A Regular Meeting of the Society was held at Chickering Hall, on Monday, April 13, 1896, at 8.30 o'clock, P.M.

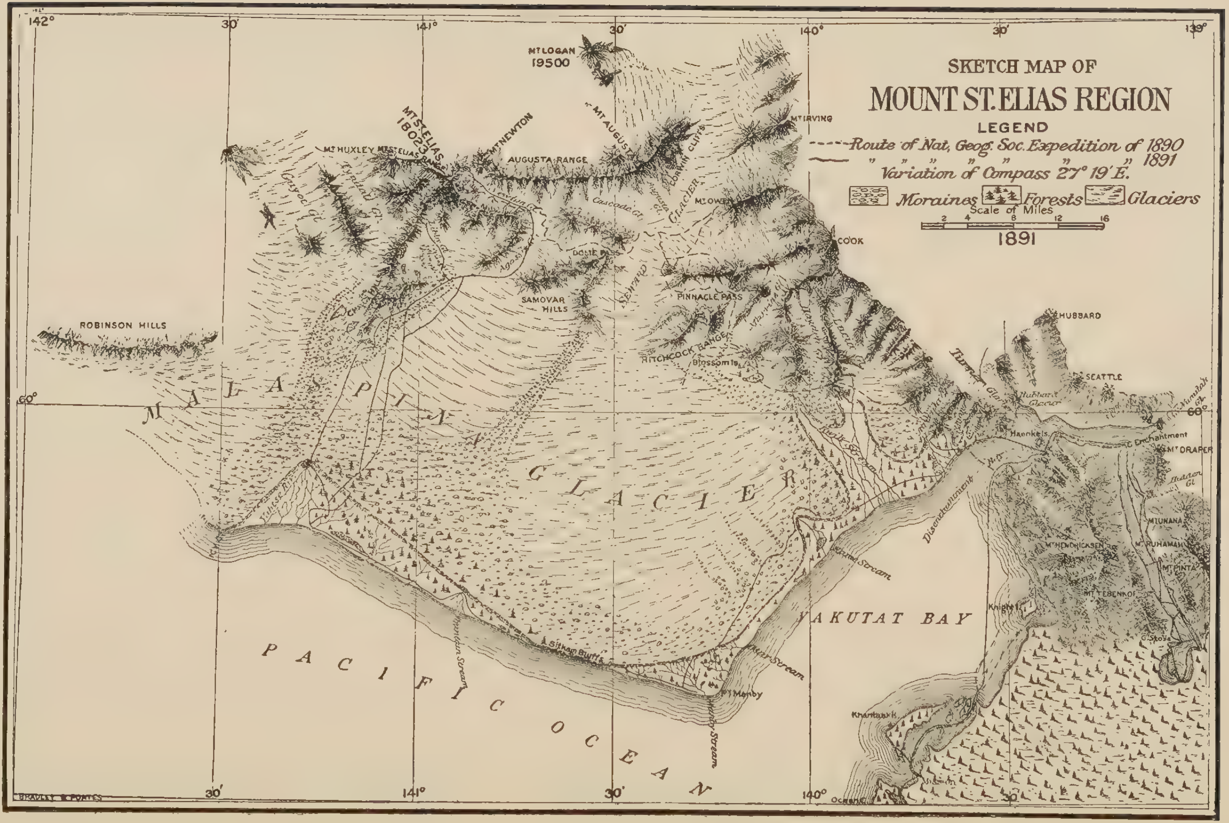
President Daly in the chair.

The following persons, recommended by the Council, were elected Fellows of the Society:

Mrs. Geo. F. Canfield. R. E. Dodge.

The President then introduced the speaker of the evening, Dr. A. Donaldson Smith, who addressed the Society on the First Expedition through Somaliland to Lake Rudolf.

On motion, the Society adjourned.


SKETCH MAP OF
MOUNT ST. ELIAS REGION
LEGEND
Route of Nat. Geog. Soc. Expedition of 1890
" " " " " " " 1891
Variation of Compass 27° 19′ E.
Moraines
Forests
Glaciers
Scale of Miles
2
4
8
12
16
1891
142°
30′
141°
30′
140°
30′
139°
60°
Mt. LOGAN
19500
Mt. ST. ELIAS
18023
Mt. HUXLEY
Mt. ST. ELIAS RANGE
Mt. NEWTON
AUGUSTA RANGE
Mt. AUGUSTA
CORWIN CLIFFS
Mt. IRVING
Mt. OWEN
COOK
Guyot Gl.
Tyndall Gl.
Libbey Gl.
Agassiz Gl.
Cascade Gl.
Augusta Gl.
GLACIER
DOME PASS
SEWARD
SAMOVAR HILLS
PINNACLE PASS
HITCHCOCK RANGE
Blossom Is.
Lucia
Hayden
Marvine
ROBINSON HILLS
MALASPINA GLACIER
Yahtse R.
Sitkagi Bluffs
Manby Stream
Pt. Manby
Fountain Stream
Kwik Stream
Atrevida
Turner Gl.
HUBBARD
SEATTLE
Hubbard Glacier
Nunatak Gl.
Haenkels
C. Enchantment
Mt. DRAPER
Ladder Gl.
Disenchantment
Mt. UNANA
Mt. HENDRICKSEN
Mt. RUHAMAH
Mt. PINTA
Mt. TEBENKOF
Knight I.
G. Stove
YAKUTAT BAY
Khantaak
Ocean Cape
PACIFIC OCEAN
BRADLEY & POATES

BULLETIN

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MOUNTAINEERING IN ALASKA.

BY

ISRAEL C. RUSSELL.

An approximate estimate of the difficulties to be overcome in climbing various mountains can be had by comparing the height and distance of their summits, above and beyond the highest point at which a camp-fire is available without transporting fuel.

When camp-fires can be had not only is there no necessity for carrying alcohol or oil, together with the necessary apparatus for burning it, but one can exist with less covering, especially when sleeping, and also requires less food than when camping above "timber-line." We should also note the advantages gained from the feeling of security and comfort that a blazing fire brings to the weary and perhaps storm-bound explorer. It is generally true, also, that climbing is comparatively easy on slopes where plants, especially trees, can grow; thus making it even more evident that the main difficulties awaiting a mountaineer are concentrated above the upper limit of tree-growth, or the timber-line.

If we measure the difficulties of climbing the mountains of America by the standard suggested above certain interesting facts appear. On Chimborazo, the highest point where a camp-fire is available is at an altitude of about 15,000 feet. The height of the mountain, according to Whymper, is 20,545 feet, thus leaving approximately 6,000 feet as a measure of the actual mountaineering required in order to reach the highest summit in the New World.

The great volcanoes of Mexico are a little over 18,000 feet high, and the timber-line may be taken at 14,000 feet. In the Sierra Nevada the highest summit, Mt. Whitney, has an elevation of

14,522 feet, and trees cease to thrive at about 11,000 feet, leaving but three or four thousand feet of the ascent in which a camp-fire cannot be had without transporting fuel. Mt. Shasta and Mt. Tacoma each have elevations of about 14,500, and rise some seven thousand feet above the encircling forests. In the Rocky Mountains the upper limit of vegetation is somewhat greater than on the peaks just named, and besides the massiveness of the uplifts and the general absence of sharp crests and spine-like peaks makes them comparatively easy of ascent.

In all of the instances referred to above, which include the highest mountains in North America south of the Alaskan region, the distance to be traversed between the highest camp-fire and the objective point is at the most only a few miles.

The usual plan for ascending lofty mountains is to establish a camp at the highest accessible point at which a fire can be had without transporting fuel, and then to "hold on" until the weather is favorable, and with but slight impedimenta make a dash for the top. If the first attempt fails, a retreat can be made to the timber-line camp, where safety is assured, and another attack can be undertaken when the conditions are again favorable. In the case of most of the mountains referred to in the last paragraph, the timber-line can be reached by pack animals,—indeed, in many instances mules may be taken to the actual summit—thus making it practicable to secure a base of operation with a comparatively small expenditure of time and energy.

As the timber-line decreases in elevation from the tropics toward either pole, the difficulties to be expected in climbing various peaks of about the same height are indicated in a rough way by their latitude. The lower limit of perpetual snow in the tropics is about 18,000 feet, and it descends lower and lower toward both the north and south. The mountains in high latitudes are frequently sheathed from summit to base in snow-fields and glaciers, thus vastly increasing the obstacles that one has to overcome in order to reach their tops.

The highest mountains in North America are in Alaska and the adjacent part of Canada, where the timber-line is low and glaciers descend to sea-level. In the neighborhood of Mt. Logan, 19,500 feet high, and so far as known the highest summit on this continent, and of Mt. St. Elias, with an altitude of 18,023 feet, the timber-line is only 1,500 or 2,000 feet above the sea. Not infrequently the highest available camp-fire in that region is considerably below the upper limit of timber growth. To reach the summit of

Mt. Logan, or Mt. St. Elias, one is obliged to travel not less than fifty and probably fully seventy-five miles in each instance, after leaving the cheerful blaze of the last camp-fire. When one considers the amount of fuel, provisions, clothing, blankets, tents, etc., required for so long a trip in the snow, he will begin to appreciate the difficulties and hardships of such an undertaking.

With this general statement of the comparative difficulties of mountaineering in different latitudes, I wish to invite the reader's attention to some features of the second of two attempts made by the writer to reach the summit of Mt. St. Elias.*

On June 6, 1892, I reached Icy Bay, the nearest point on the coast to Mt. St. Elias, on the U. S. Revenue steamer *Bear*, in command of Captain M. A. Healy. Icy Bay is a misnomer, as there is no indentation of the coast at that locality. A landing had to be made through the surf on an open beach, the character of which was unknown. The transfer of my party and of our stores from the vessel to the shore was made in small boats, in command of the Lieutenants of the *Bear*. This difficult task was carried out with both bravery and skill, but, unfortunately, four of the boats capsized in the surf, and from one of them, containing seven men, only one man reached shore alive. The provisions and instruments carried in the boats that capsized were washed ashore and picked up on the beach. The boats that did not meet with serious trouble took in more or less water, so that nearly all of our supplies ran the risk of being water-soaked. Owing to careful packing, however, and to the fact that the greater part of our rations were secured in tin cans, securely soldered, but little damage was done.

Our first camp was in a beautiful flower-decked meadow, beneath young spruce trees. After "caching" such articles as were not needed for the inland journey, on a raised platform where they would be out of the reach of bears, we began the line of our march toward Mt. St. Elias.

My companions were five in number, one of the original party, W. C. Moore, having been drowned. Three of the men were with me on a similar expedition the year previous, and had acquired some experience in mountaineering; the others were familiar with frontier life and well qualified for the hardships before them. We had no pack animals, and all of our "outfit" had to be carried on our backs, or *packed*, to use the technical language of the frontier.

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* "An Expedition to Mt. St. Elias, Alaska," in National Geographic Magazine, (Washington, D. C.), Vol. 3, 1891, pp. 55–200.

"Second Expedition to Mt. St. Elias, Alaska," in Thirteenth Annual Report of the Director of the U. S. Geological Survey, 1891–2, pp. 1–91. Washington, D. C., 1894.

For about two miles northward from the first camp, our route was across a smooth sand-plain, on which travelling was easy, except that a number of swift, muddy streams of ice-cold water had to be forded. One of these streams, too deep and swift to wade, was crossed by means of a rude foot-bridge made of logs carried with much labor from the adjacent forest. The bridge was swept away a few hours after being built, thus compelling two of the camp hands and myself to swim the icy water, upon returning to the base camp a few days later.

At the northern margin of the sand-plain traversed during the first march, we reached the southern border of the great ice-sheet, known as Malaspina glacier, which intervenes between Mt. St. Elias and the Pacific. The margin of the glacier where we first reached it is about 500 feet high and densely forest-covered. The forest grows not only about the margin of the glacier, but extends up over its steep border and covers the extremely rough moraines resting on stagnant ice for four or five miles inland. The vegetation is exceedingly dense. Spruce trees three feet in diameter fringe the outer margin and between their sturdy trunks there is a tangled growth of alders, aspens, ferns and other plants growing in tropical luxuriance.

Through this almost impassable jungle we were obliged to cut a trail with axes and hunting knives, before our packs could be advanced. Reaching the inner border of the forest-covered moraine, we had before us a vast expanse of barren moraine broken by thousands of crevasses, and diversified by pits and hollows holding lakes. Between the lakes rose huge pyramids and spires of ice of the most rugged description, each one sheathed with stones and dirt, which furnished only an insecure foothold. Our route lay across this desolate, lifeless area for a distance of ten or twelve miles to the clear ice beyond. This portion of our journey was exceedingly fatiguing. A single day's march over the loose, angular stones made such sad havoc with our shoes, that repairs were required almost every night.

In making a direct march from the coast to Mt. St. Elias, on the line chosen, the last place where a camp-fire can be had is at the inner margin of the forest-covered moraine, at an elevation of less than 1,000 feet above the sea and about seven miles inland. The only available route to the summit of Mt. St. Elias is by way of the Agassiz glacier, which curves about the eastern base of the mountain and receives a tributary ice stream, known as Newton glacier, from its northern side. As my object was especially to study the glaciers and the geology of the region explored, we did not take the most direct route, but for this and other reasons, made a detour to the west and visited the Chaix hills which rise through the Malaspina glacier and attain an elevation of 3,000 feet above its surface. The southern base of this rugged island in the ice, is forested and affords excellent camping places at an elevation of between 1,500 and 2,000 feet. We there established our highest "fire camp" and making a reassortment of instruments and supplies, took with us to the higher regions only what seemed strictly essential. Our highest camp-fire was at least 16,000 feet lower than the peak we wished to climb and by the only available route, without considering minor deflections, not less than twenty-five miles from it. Every rod of this distance was over glaciers and snow-fields. During much of this toilsome march we threaded our way through a net-work of crevasses, so that the actual distance traversed was much nearer fifty than twenty-five miles.

CROSSING MALASPINA GLACIER. A MOMENT'S REST.

At the Chaix hills I encamped alone for five days, while my companions were advancing the packs across the barren moraines of the Malaspina glacier to the clear ice in its central portion, where a temporary cache was made. My camp was by the side of a broad game-trail on which fresh tracks of huge bears were abundant. During my stay I explored the neighboring region, and with much labor cut spruce trees and built a sled with which to continue the journey across the clear ice of the Malaspina glacier and up the Agassiz glacier. The task of constructing a sled was difficult, as trees with the required curvature for runners had to be cut on steep slopes, and in one instance on the side of a precipice where a slip would have been fatal. After securing the necessary sticks, they had to be hewed and sawed into shape with tools that were inadequate for the purpose. With the aid of a few nails and some copper wire, a sled was finally made that was strong, if not beautiful, and afterward did good service. When the men rejoined me, we cut a large spruce tree having a curved trunk and hewed out a toboggan. The sled and toboggan were then carried across the rough moraine bordering the Chaix hills on the east, to the cache that had been made on the clear ice, and the march northward renewed. Owing to the roughness of the ice at the start, the toboggan became so frayed and torn that it was soon rendered useless and had to be abandoned. By making double trips with the sled, the supplies were at length advanced to the foot of the lowest ice-fall in the Newton glacier. The sled was then left, and is now probably being carried slowly southward by the flowing ice. It will perhaps be found during the years to come, on the border of the Malaspina glacier to the east of the Chaix hills.

After leaving our comfortable and exceedingly picturesque camp at the Chaix hills, we were enabled at our first camping place to pitch our tents on a thin moraine, composed of fragments of black slate, on the margin of the clear ice of the Malaspina glacier. At the next advance we found a luxuriant carpet of mosses and flowers, on which to spread our blankets, at the extreme western end of the Samovar hills. Above the Samovar hills, however, every camp was on the open snow-fields, at a sufficient distance from neighboring precipices to be safe from avalanches.

During our sojourn in the snow we used tents of light, cotton cloth, seven feet square, supported by a ridge rope, the ends of which were usually made fast to alpenstocks. At the corners, the tent was held down by packs, cans of provisions, and, in fact, anything that could be extemporized for the purpose. At times hunting knives were used for tent pins. On two occasions when it was necessary for me to pitch a tent without assistance, having only one alpenstock to use for a tent pole, I piled up snow so as to form a slender column three or four feet high to support the tent at the rear. Water poured over the column soon froze and held the snow firmly. The base of the tent was then pressed into the snow and water poured on and allowed to freeze. My tent was thus "frozen up," as one might say, instead of being "pinned down."

Our cooking was done over a double-wick, coal-oil stove, provided with a tin reservoir. Oil was carried in one-gallon cans, as hand packs. Our provisions consisted principally of "flap-jacks," made of wheat flour and corn meal, and fried meat, either bacon, corn beef or pemican, and coffee. But little tea was used. Some of our camps were near shallow pools on the snow, from which water was obtained; at other times we were enabled to draw water from crevasses by means of a bucket attached to a line; usually, however, we had to melt snow or ice in order to obtain the water necessary for drinking and cooking. As to washing, a handful of snow rubbed over the face and hands was our only means of bathing during the weeks we were above where a camp-fire was available. Of clothing, we had a good supply of woollen garments, including thick flannel shirts and heavy, knit socks. Each man had also one double woollen blanket in which to sleep at night. During several nights, which will be long remembered on account of their discomforts, I slept on the névé of the Newton glacier, with two companions under one blanket, supplemented by oil coats and a top and bottom layer of canvas.

No alcoholic liquors of any kind were taken; although a small supply in case of accident would have been advisable. Several of the party indulged in the use of tobacco. In our lonely camps in the snow, when fierce storms threatened to carry away our frail shelter, a grateful pipe brought rest and contentment that even the most ardent reformer would have been pleased to see. Many were the tales of frontier life and adventure told under the influence of that mild sedative. I would like to enlarge upon some of these stories, if enlargement were possible, and to preserve them in a permanent form, but space will not allow of such a digression.

Fur garments and fur sleeping bags would have been unavailable even if we had taken them, for the reason that we were frequently exposed to rain and had to sleep many times on snow saturated with water. Fur clothing is unquestionably the best that can be had when the temperature is below freezing; but nothing is more uncomfortable when water-soaked. In addition to our woollen garments, each man was provided with an oil-coat and a "sou'wester." Our blankets were rolled in canvas to protect them when travelling and serve as a substratum together with oil-coats when sleeping.

The equipment described above will no doubt seem inadequate to many who are not accustomed to "roughing it"; but thus provided, we lived for five weeks on the broad snow-fields without a single camp-fire to warm our benumbed fingers or to dry our clothing. Even when protected from the rain by water-proof coats, our garments, while carrying heavy packs, became wet with perspiration and rendered exceedingly uncomfortable. In spite of long exposure and reduced rations, every one of the party enjoyed the best of health and returned to civilization stronger and more rugged than at the beginning of the season.

Packs, weighing about fifty pounds, were carried by each man, by means of "pack straps" made of several strands of hemp-line, known as "cod-line," and intended for use in cod fishing. These lines were chosen instead of leather straps, not only because of their lightness, but for the reason that in cases of necessity the "straps" could be quickly undone and used as life-lines. We also had ropes for fastening ourselves together in the usual manner when travelling over crevassed snow. Each man was provided with a hickory alpenstock, seven feet long and one and one-fourth inches in diameter at the centre, tapering to one inch in diameter at the ends. These were furnished at one extremity with a steel spike about three inches long, with a hook near the ferrule, after the manner of boat-hooks; the other extremity was armed with a chisel with a cutting edge two and one-half inches broad. The chisels enabled one to cut steps on descending slopes, and to clear away the loose snow on the opposite side of a crevass across which it was necessary to spring. In these and many other ways our strong alpenstocks were found to be of great service. Instead of the conventional ice-axe, we carried smaller implements of the same general pattern, with handles 16 inches long. These ice-hatchets, as they may be called, were tied to our packs when travelling, and only carried in the hand when actually required for cutting steps. Colored glasses were indispensable, and were worn when we travelled during the day. Our shoes were of the strongest make available, but were constantly in need of repairs. Material for cobbling was provided, but the demand for leather for patches became so great that instrument cases had to be sacrificed for that purpose. While crossing the rough moraines near the coast, our shoes were shod with broad headed nails of soft iron, supplemented with spikes and sharp-headed screws when we reached the clear ice. At greater elevations, where the snow was soft, the long spikes used by lumbermen when walking on floating logs, were added to what remained of the armament previously employed.

Owing to the high latitude in which Mt. St. Elias is situated, the summer days are long. During the greater part of our stay above timber-line, it was light enough when the sky was clear, even at midnight, for one to read ordinary print or to write notes. This enabled us to make night marches and avoid the intense glare of the sunlight reflected from the snow. At night, the temperature usually fell below freezing, and the snow, softened during the day so as to be quite impassable, became sufficiently hardened to be traversed with comparative ease. Another advantage of travelling by night was that we could sleep during the day when the air was warm. The night marches were frequently enjoyable, owing to the exquisite beauty of the white-robed mountains when illuminated by the soft twilight. At night, the sun declined only about eight degrees below the northern horizon, and the glories of the after-glow were frequently prolonged until they merged with the radiance of the succeeding morning.

In ascending the Newton glacier, our route lay through a region of magnificent ice-falls, some of them a thousand feet high, and broken into a great variety of spires and pinnacles. In some of these difficult places we were obliged to thread our way through partially-filled crevasses, and to cut steps up nearly vertical escarpments. Dashes up these difficult and dangerous places were made at night or in the early morning when the snow was hard, and the danger from avalanches at a minimum. Between the ice-falls, the grade of the glacier is gentle, but the ice deeply crevassed, thus necessitating many wide departures from the direct route. When crevasses blocked the way we were sometimes obliged to make a detour of half a mile or more in order to advance a few feet. Many narrow snow bridges had to be crossed, where a misstep would have caused a tumble into a seemingly bottomless abyss. These crystal crypts of the vast cathedral among the spires of which we were exploring, were exceedingly beautiful, and called forth many exclamations of wonder and admiration. Even when we had to crawl across some frail arch of snow, for fear it would give way if our weight should be concentrated on a small area, the exquisite beauty and the wonderful coloring of the blue depth below would cause us to pause and admire the delicate tracery of the fairy-like chambers beneath. Although dangers unfamiliar to those who have not lived in high mountains were numerous on the treacherous névés, yet the novelty and constantly varying wonders of the region more than repaid us for the toil and hardship encountered.

The greatest hindrances to our advance were the mists and clouds that frequently enveloped the mountains and concealed every line of the sublime picture as with an impenetrable veil. With the mists came rain and snow. At such times there was but one thing to do, and that was to wait. When a way ahead free from avalanches could not be chosen, we pitched our tents in the snow and waited as patiently as possible for the veil to be lifted. During these long delays, additional supplies were advanced from lower camps, as opportunity served; but when the line of footprints made during the upward journey became faint and finally disappeared beneath the fine light snow that fell, hour after hour and day after day, with weary monotony, our line of communication was broken. Energy and enthusiasm were then unavailing, and patience became the ruling virtue.

Our highest camp was at an elevation of about 8,000 feet in the vast amphitheatre in which the Newton glacier has its principal source, and was held for twelve days. During the greater part of the time we were enveloped in clouds, and several times our tents became deeply buried beneath the snow. The site of the camp was hastily chosen during the prevalence of a dense mist which rendered it unsafe to continue advancing, as the roar of avalanches from neighboring precipices told that a too near approach to the veiled peaks would be disastrous.

During the twelve days that we lay in our highest camp there was but one opportunity to advance. Starting at two o'clock on the morning of July 24, we climbed the precipitous and deeply crevassed snow-slope, about four thousand feet high, leading from the amphitheatre where our camp was placed, to the divide between Mt. St. Elias and Mt. Newton. Much of the way had been swept by avalanches, and was so steep that steps had to be cut for perhaps half of the distance. From the divide, about 13,000 feet in elevation, an inspiring view was obtained of the vast snow-covered mountains to the north, a region never before seen by man. The day was unusually fine, and the air so clear that Mt. Fairweather, 150 miles distant, stood out so sharply against the dark sky that it seemed scarcely fifty miles away. Thousands of rugged peaks, rising from a general névé region, with an altitude of about 8,000 feet, filled all of the northern and western sky, but Mt. Newton, standing near at hand, shut out the view to the northeast and concealed Mt. Logan. That majestic peak, worthy to bear the name of Canada's famous geologist, came into view later, as we ascended the northern slope of the crowning pyramid of Mt. St. Elias.

The sunlight reflected from the shining snow-fields around us was of blinding intensity. We wore deeply colored glasses to protect our eyes, but our faces, although tanned and weather-beaten by much exposure, were blistered by the intensity of the heat. On account of the rarity and dryness of the atmosphere, however, the temperature in the shade was below freezing. A thermometer thrust an inch or two deep in the snow fell at once to 16° of the Fahrenheit scale. While my companions, Stamy and McCarty, dug a hole in the side of a steep snow-bank in which to place a small lamp for the purpose of melting snow so that we could quench our great thirst, I studied the far-reaching panorama spread out before me and sought to learn some of the secrets of the wild region where so many great glaciers have their birth.

After resting and taking a light lunch, we continued on up the steep slope leading to the summit of Mt. St. Elias, having to cut steps nearly all the way. As we rose above the divide, the view became wider, and at last, when higher than the summit of Mt. Newton, nothing obscured the vast panorama except the peak we were ascending. About four o'clock in the afternoon we reached an elevation of over 14,500 feet, and could have gained the summit had not prudence dictated that we should turn back and advance our camp to the divide between Mt. St. Elias and Newton before making a push for the top. We had already climbed 6,500 feet, since leaving our tent, on slopes so steep that steps had to be cut much of the way. No mountaineer could do more and return to camp without an interval of rest. A change in the aspect of the sky told that a storm was gathering, and as night was approaching, it became imperative that we should regain our camp before darkness rendered it impossible to retrace our steps through the maze of crevasses below the divide. We reached our tent twenty hours after leaving it, and none too soon, as the shadows in the bottom of the amphitheatre were so dense during the last mile of the descent that we could not follow the trail made in the morning, and had to find our camp more by instinct than anything else. Much fatigued, we slept until late the next morning. Renewed storm rendered it impossible to advance our camp to the divide between Mt. St. Elias and Mt. Newton, as we had hoped to do. At last, weary with waiting, we abandoned the hope of reaching the summit and reluctantly retreated toward the base camp at Icy Bay. The descent was made through clouds and rain. The snow was soft and treacherous and travelling exceedingly fatiguing. These discomforts were no greater than we had experienced many times before, but the feeling that we had failed in our undertaking, took away the buoyancy that encouraged us during the ascent and made us more sensitive to our surroundings. After three long weary marches we regained our old camp-ground at the western end of the Samovar hills, and for the first time in five weeks spread our blankets on a mat of vegetation and inhaled the delicious odors of flowers.

After reaching Icy Bay we made a weary march of sixty miles or more, eastward, along the coast to the head of Yakutat Bay. When near the shore we were obliged to wade many swift, icy streams that threatened to sweep us into the sea, and when seeking to avoid this danger by going farther inland, we encountered rough moraines or had to force our way through tangled vegetation. This portion of our journey was made in the teeth of a cold, northeast storm, and was even more trying to our endurance than our sojourn above the snow-line. At last, after about three months of toil and hardship, during which we had not seen a single human being outside our own party, we reached the Mission at Yakutat and obtained letters from home.

THE INDIANS OF BRITISH COLUMBIA.

BY

DR. FRANZ BOAS.

During the last seven years my studies of the North American Indians have led me frequently to the coast of British Columbia, into the recesses of its deep fjords and to the storm-beaten shores of its islands. In the following remarks I will describe some of the results of my studies and some experiences, but I will dwell particularly upon the interesting customs which it was my good fortune to observe in a cruise along the coast last winter.

Many are the tourists who nowadays in commodious steamers pass up and down the rugged coast of British Columbia on their tour to Alaska and many a time have the beautiful fjords, the snow-covered mountains the foot of which is clad in evergreen forests been described in vivid colors. But a different impression is left on the mind of him who in a small canoe passes through the intricate channels of the coast, tossed by tempestuous squalls which blow down the sides of the mountains and struggling against the rapid tides which in places rush like torrents through narrow openings. The overwhelming solitude and stillness of the shores, the monotony of the dark pines and cedars, of the channels and of the roaring cascades beget a longing for the sight of human work, of human habitation, that swallows the admiration of the magnificent scenery. Gladly welcomes the traveller the smoke which is seen to arise in the far distance, at a place where the steep coast line is interrupted by a small flat and which indicates the presence of an Indian village. While thus travelling from place to place with my Indian friends I had ample opportunity to become familiar with their life, their customs and their ideas.

Before describing the life of the Indians I may be permitted briefly to summarize what we know about their general appearance and their relationships to each other and to the rest of the American race. The casual visitor is first of all struck by the remarkable similarity of the natives of the North Pacific Coast with the races of Eastern Asia. Even after a long acquaintance with the people single individuals are found whom one might almost mistake for Asiatics. It happened to me even last winter that I met a broad-faced, light-complexioned person, with brownish, almost black hair, attired in a sailor's suit, whom I was unable to classify for quite a while. Finally he happened to look sideways, which brought into prominence a very strongly Mongoloid eye—the peculiar eye, that we always see in Chinamen—and this settled in my mind that he must belong to Asia. In fact he proved to be a Japanese. This formation of the eye which is more strongly marked in the Mongol is sometimes the only means of detecting the difference between individuals belonging to the two races. Taken as a whole, however, the face of the Indian is much heavier built, his hair is not as coarse as that of Chinamen or Japanese. Young persons have the Chinese eye often just as strongly developed as the Chinese themselves. We may say that the people, particularly those of the northern parts of the territory, occupy a position intermediate between the Indians of the plains and the East Asiatic races.

But the tribes of this coast are by no means homogeneous. A few of them take quite an exceptional position. In most cases the noses and faces of these Indians are wide, but low. Among the southern tribes there are some, whose faces are, to the contrary, wide and very high, the noses being at the same time narrow and almost Roman in form. It is remarkable that as soon as we cross the mountains of southern British Columbia the characteristic Indian face becomes very prominent.

I must not omit to mention one peculiarity. We are accustomed to consider the Indians as possessed of black, straight hair, and as of a reddish complexion. The hair of the Indians of the North Pacific Coast is very frequently slightly wavy and brownish, his complexion is very light. There are even a few tribes among whom red hair and almost white complexions occur.

The most striking peculiarity exhibited by these tribes is the effect of the custom of artificially deforming their heads by closely bandaging and pressing the head of the infant as long as it is in the cradle. By this means growth of the head sideways is stopped and it grows backward and upward. The forehead becomes at the same time flat and receding.

It is very curious that in the region of which we are speaking a great many different methods of deforming the head are in use. Further to the south, instead of lengthening the head, the Indians flatten it. They bring a strong pressure to bear upon the forehead.

The custom of deforming the head is very widely spread, and was still more so in olden times. In America it is still practiced on the coast of British Columbia and as far south as Oregon. The tribes of Kansas flatten their heads. Formerly all the people of

Colorado, of the lower Mississippi, of the West Indies, and the Peruvians deformed the heads of their children.

Outside of America the custom is found in several islands of the Pacific Ocean and, what seems hardly credible, in southern France. The last-named occurrence seems to be the only survival of a custom which in antiquity was practiced from the Caucasus through Hungary to southern France. It has often been asked what the meaning of this practice may have been. We must undoubtedly consider it simply as a fashion which grew up as other fashions do and as having no more nor less meaning than the deformation of the feet by the Chinese, of the teeth by the Africans, or of the waist by our own ladies.

If in regard to their physique these Indians are by no means uniform, they are still less so in regard to their languages. Seven radically distinct languages are spoken by them in this small area, and some of them are split up in subdivisions to a marvellous extent. When saying radically distinct languages, I mean that they differ as much in structure and in vocabulary as English and Turkish, which as we know are not related at all; while the subdivisions may differ as much as English and Greek, both of which belong to the Aryan stock. There is only one thing which these languages have in common, namely, their extreme harshness, superabundance of consonants and scarcity of vowels, combined with an extreme energy of pronunciation. The languages are in structure similar to other American languages. In this respect no affinity to Asiatic peoples is found. They fall naturally into a number of groups which show very interesting geographical relations. The languages of southern British Columbia resemble in structure somewhat those spoken on a belt which stretches along the Northern States and Southern Canada right across the continent. The languages of the north are, on the other hand, somewhat analogous to the languages spoken in the whole extreme northwestern portion of America; but each of these two groups is wholly unlike the other.

I will not enter into these somewhat difficult relations any further, but will describe that portion of my travels which seems to touch upon some of the most interesting problems of Indian history.

On several of my trips I had visited a tribe who bore the proud name of the Kwakiutl, the "smoke of the world." This name, I might say, almost characterizes the Indian. The "smoke of the world," that means that their hospitality is such that the smoke of their fire at which the food is being roasted fills the whole world, and that the fire is being kept burning all the time. When I first visited the tribe my arrival gave rise to much speculation and distrust, which led to my being invited to attend a council at which the subject was to be discussed. At that time the minds of the Indians were much stirred by efforts of the Canadian Government to put a stop to certain dances and ceremonials, and every stranger was suspected as a Government agent with sinister designs. In the council I was addressed as follows by the chief of the village:

"We want to know whether you have come to stop our dances and feasts, as the missionaries and agents who live among our neighbors try to do. We do not want to have anybody here who will interfere with our customs. We were told that a man-of-war would come if we should continue to do as our grandfathers and great-grandfathers have done. But we do not mind such words. Is this the white man's land? We are told it is the Queen's land; but no! it is mine! Where was the Queen when our God came down from heaven? Where was the Queen when our God gave the land to my grandfather and told him, 'This will be thine'? My father owned the land and was a mighty chief; now it is mine. And when your man-of-war comes let him destroy our houses. Do you see yon woods? Do you see yon trees? We shall cut them down and build new houses and live as our fathers did. We will dance when our laws command us to dance, we will feast when our hearts desire to feast. Do we ask the white man, 'Do as the Indian does'? No, we do not. Why then do you ask us, 'Do as the white man does'? It is a strict law that bids us dance. It is a strict law that bids us distribute our property among our friends and neighbors. It is a good law. Let the white man observe his law; we shall observe ours. And now, if you are come to forbid us to dance, begone; if not, you will be welcome to us."

My words in reply to this speech seem to have been taken very kindly, for since that time I have never been made more at home than among this tribe.

How much more friendly was my reception last year. On one of my later visits I had received an Indian name, Heiltsakuls, "The one who says the right thing." I was coming down the coast in a small steamer which, as it approached the village in the middle of the night, blew its whistle until a canoe came alongside. I was recognized at once and paddled ashore, and many were the welcomes that were offered to me that night.

I had arrived at a most opportune season for my studies. The whole tribe and a great many friends from neighboring villages were assembled to celebrate the great religious ceremonial which takes place about midwinter. There was excitement in all the houses. Here preparations were made for feasts, there the approaching ceremonies were earnestly discussed. Others were busy collecting all their property in order to pay off debts, which is considered one of the most important transactions in the life of these Indians.

On the morning after my arrival I invited at once the whole tribe—about 250 souls in all—to a feast. It was a feast *to them*, although the provender which I furnished consisted of nothing but hard tack and molasses. Before the biscuits were distributed I had to make the formal speech depreciating my small feast and asking my guests to be happy and to eat to their hearts' desire. In return I was told that no feast like mine had ever been given and that I was a great chief. The figurative speech of the Kwakiutl Indians has it about like this: "You are the loaded canoe that has anchored in front of our village and is unloading its riches; you are the precipice of a mountain from which wealth is rolling down upon all the people of the whole world; you are the pillar supporting our world." And all this for a treat of hard tack and molasses. But the gross flattery of this speech must not be taken too seriously, as it is simply a stereotype formula used for expressing the thanks for a feast.

Custom requires that before the feast four songs are sung. The young men—the singers—sit in two or three rows in the rear of the house. Planks are laid in front of each row, and they carry short sticks to beat time with. As soon as the time for opening the song begins the singing master jumps upon a box and gives the signal to begin. At once the deafening noise of the beating of the boards begins, and then the chorus commences the song. I regret that I cannot give an example of this peculiar music. It has often been said that Indian music is no more than a meaningless and senseless howling, but to him who knows to listen to the music so imperfectly rendered by untrained voices the weird strains soon gain a curious attraction. As the musical phrases repeat themselves and appear in new and unexpected combinations, the art of the native composer becomes clearer and clearer. As new rhythmical forms are introduced into the song we recognize beauties which were at first obscured by their imperfect rendition. The words of the songs also prove a deep poetical feeling, although this becomes not so apparent in feast songs, which are made distasteful to the refined ear by an incredible amount of brag on the one hand and of flattery on the other.

Let me give a few examples of this poetry in translation. Here is a feast song:

1. I am a great chief, famous all over the world. I am the highest chief among all the tribes. Chiefs are my servants. Chiefs are my messengers. Chiefs are to me like my ragged, torn blankets. Do not irritate me, else I will destroy your property and your lives. I am like to a mountain whom nobody can scale, towering over the chiefs of all mankind. I have destroyed a whole tribe. When I approach, a heavily loaded war canoe, chiefs wish to hide under ground. I destroyed the tribes at the north end of our world.

2. Do not let my gaze behold you. Do not annoy ME, of whom you hear even at the edge of our world, else I shall tie your hands and hang you. You shall know my greatness: I am as powerful as one whole tribe; yea, I am as powerful as four tribes. I am the one who stands on top of the highest mountain. My face shines like red copper. I am the great mountain. I am the pillar of the world. I am the one who stems the tide; chiefs are my servants.

But I should convey a too unfavorable impression of my Indian friends if I did not also render to you one of their love songs which reveals a deep and passionate feeling:

1. Like pain of a burn is my love of you, my dear.
2. Like pain racking my whole body is my love of you, my dear.
3. Like sickness is my love of you, my dear.
4. Like a wound hurts me my love of you, my dear.
5. Like fire burns me my love of you, my dear.
6. I am thinking of the words that you spoke to me.
7. I am thinking of the love you bear me.
8. I am trembling before the power of your love.
9. Oh, what pain do you cause me.
10. Oh, where is my true love going, my dear ?
11. Oh, my true love is going to leave me.
12. I feel faint on account of the words my true love spoke to me.
13. Good-bye, my true love, my dear.

In the course of the feast many speeches are made which refer to the transactions of the daily life of the people. In order to explain this I must say a few words in regard to the curious economic system that has arisen among the tribes. The coin and the unit of value of the Indians is the single blanket, formerly a fur blanket, but now a cheap woollen blanket. All their possessions are invested in blankets, and in these a system of credit has developed. The total number of blankets in a village may be a few hundred, while the accumulated wealth would amount to many thousands. As soon as a person receives blankets in payment for services or for sold objects he loans them out to those in need of blankets. They must be repaid with a high rate of interest, which ranges according to time and circumstances at from 25% to 300%. Thus the cautious and careful are able to build up large fortunes in comparatively a short time, although they may not possess more than a few blankets at a time. At a certain time they may have to repay a considerable debt to some one individual. This is always done publicly, and is made the occasion of much ceremony. Often at the same time blankets are presented to other members of the tribe. These *must* accept the present, but by accepting it become debtors to double the amount received. Thus the seeming squandering of property is actually no more and no less than a profitable investment. Nevertheless a distribution of property brings honor and increased influence. I believe this is the most complex economic system that has developed anywhere among the native races of America, particularly in so far as it is based to a large extent upon credit.

It is clear that such a system, once established, must influence the social life of the people very considerably, and that is what we actually observe. The investment of property and its return with appropriate ceremonies is the one dominating thought of these people. As the frequent distributions of property are considered to raise the rank of the giver, they are also made occasions to bring forward the feats of the ancestors from whom the rank and position of the Indian is derived. Thus it happens that the family legends are related at such occasions with much pride and with great ceremony. In conclusion of the ceremony a young relative of the person who distributes the property is made to dance. These events mostly took place during the daytime, while the evenings were reserved for feasts. The second night of my stay a feast took place, which was very interesting in many respects. Everything had been going on very quietly and sedately as described before. The four songs had been sung and the host was delivering his speech when, all of a sudden, he was interrupted by an unearthly cry which came from among the people who were standing behind him. A youth rushed forward into the middle of the house in a state of greatest excitement. He fell down as though in a fit and suddenly he was seen to fly upward to the roof, to the right and to the left through the house, and now he had disappeared.

For a short time dead silence reigned. Then the voices of birds were heard on the roof and the youth's clothing, all covered with blood, fell down into the house. The father took it up, and amid the greatest excitement, exclaimed, "Do you know what this means? The spirits have taken away my son. He is being taken to their house at the north end of the world. They are going to instil their desires into him and he will return a cannibal." The ensuing excitement was indescribable. There was a general screaming, speechifying and beating of boards. The medicine men danced around the fire, shaking with every limb of their bodies. The fire was extinguished and the people almost fled to their houses.

I must now explain what this disappearance of the youth meant. The origin of this custom, according to the folk-lore of the Kwakiutl, is derived from a number of spirits living in the woods. Among these one called Bakbakwalanukseewae—that means the cannibal at the north end of the world—is the most important. The following legend illustrates the ideas of the Indians in regard to this spirit:

Once upon a time there lived a man who had four sons. His name was Noakowa, the wise one. One day the sons were going to hunt mountain goat. Before they started Noakowa said, "When you go hunting you will reach a house from which a reddish smoke is rising; do not enter there; it is the house of the cannibal spirit Bakbakwalanukseewae." The sons promised to obey and started on their expedition.

After a while they saw a house, from the roof of which black smoke was rising. It was the abode of the black bear. They proceeded, and after a short while they found another house from which white smoke was rising. They entered and saw that it was the house of the mountain goat. Having rested they proceeded, and at last they saw a house from which a reddish smoke was rising. They stopped and spoke unto each other, "Shall we pass by this house? Let us enter and see who lives in it." This they did, and found a woman who was rocking her baby. Opposite her sat a boy with an enormously large head. The four brothers stepped up to the fire and sat down on a box. In doing so the eldest one hurt his leg, and blood dripped from it. The boy with the large head nudged his mother and whispered, "O, mother, how I should like to lick that blood!" When his mother told him not to do it he scratched his head and soon began, notwithstanding her command, to wipe off the blood and to lick it from his finger. Then the eldest brother nudged the youngest one and said, "O, I think father was right. I wish we had followed his advice." Meanwhile the boy licked the blood more and more eagerly.

The eldest of the brothers mustered courage. He took an arrow from his quiver and shot it through the door of the house, then he told his youngest brother to go and fetch the arrow; he obeyed, but as soon as he had left the house he ran away towards his home. After a little while the eldest of the brothers took another arrow from his quiver and shot it through the door of the house. He told the next brother to fetch it, and he also made his escape. When he had shot a third arrow the third brother escaped. Then the boy with the large head began to cry, for he was afraid of the eldest of the brothers. The woman asked, "Where have your brothers gone? I hope they will be back soon." "O, yes," replied the young man, "they have only gone to fetch my arrows." So saying, he took another arrow from his quiver and shot it through the doorway of the house; then he went himself to fetch it. As soon as he had left the house he followed his brothers. After a short while, when the youths did not return, the old hag knew that her guests had escaped. She stepped to the door and cried, "Bakbakwalanukseewae, come! oh, come! I have allowed your good dinner to run away." Her husband, although far away, heard her cries and quickly approached. The four brothers heard him approaching and ran as fast as their legs would carry them. The eldest was carrying a whetstone, a comb and some fish grease, which he used for anointing his hair. When the cannibal had almost reached them, he threw the whetstone over his shoulder, and lo! it was transformed into a steep mountain which compelled the pursuer to go round about it. But soon he came again near the fugitives. Now the young man poured out over his shoulder the hair oil, which was transformed into a large lake. While the pursuer had to go around it the young men gained a good start on him. When he had almost reached them for the third time, the eldest of the brothers threw over his shoulder his comb, which was transformed into a thicket of young trees, which their pursuer was unable to penetrate. Before he could pass around it the young men had reached their father's house. They had hardly entered and bolted the door when the cannibal arrived and demanded entrance.

Noakowa, the father of the brothers, killed a dog, carved it and collected its blood in a dish. Then he called the cannibal to come to a knothole in the wall of the house, gave him the dish and said: "This is the blood of my sons. Take it and carry it home to your wife. I invite you to a feast to-night, and be sure to come with your wife and your children. You may feast upon my sons." The cannibal promised to come.

As soon as he had gone, Noakowa and his sons dug a deep pit near the fireplace and built a large fire. They put stones into it, which they threw into the pit as soon as they were red hot. They concealed the pit by spreading a skin in front of it. These preparations were hardly finished when the cannibal arrived in his canoe, accompanied by his wife and his three children. One of them he left in the canoe as a watchman, while the others went into the house.

Then Noakowa made them sit down in the seat of honor, near the fire, their backs turned towards the skin which concealed the pit. When the cannibal had settled down comfortably, and the meat was boiling in the large wooden kettle, he said: "Noakowa, you know how everything happened in the beginning of the world. Tell me what you know." Noakowa replied: "I shall tell you this," and beating time with his *baton* he sang:

"What shall I tell you of olden times, my grandchildren? Yon cloud was lying on the mountains."

When he had sung this spell twice the cannibal and his family felt drowsy, and when he had sung it four times they slept sound and fast. Now Noakowa removed the skin and plunged his guests headlong into the pit. Twice the cannibal cried *ham*, *ham!* then he was dead. When all had perished, Noakowa tied a rope around their bodies and pulled them out of the pit. The old cannibal's body he cut into pieces, which he threw in all directions, singing: "In course of time you will pursue man." They were transformed into mosquitoes. The boy who had remained in the canoe made his escape and lives since that time in the woods.

It is this spirit who initiates the new cannibal. After his disappearance he is supposed to stay with the spirit for a long time. When the time of his stay is nearly up the father of the novice invites all the people to his house, in order to try to bring back the lost man. I can describe only a few of the more striking features of this elaborate ceremonial, which is based on the theory that certain songs or performances will attract the novice from his distant abode and induce him to come back. As it is not known what performance may attract him, all conceivable ceremonies are shown during that night in order to try which will be effective.

There are a considerable number of dancing societies, as we might call them, each of which owns a certain ceremonial, and all of them come into activity in the endeavor to bring back the novice. Therefore this event is one of the most interesting performances to witness.

Among the secret societies there are a number whose duty it is to see that no mistakes from the prescribed ceremonial are made by the dancers or by the audience. These are mainly the cannibals, who are initiated by the cannibal spirit, the bear dancers, who always wear bear's claws, and the madman dancers, who are armed with clubs and lances. They sit on an elevated seat in the rear of the house, and as soon as a mistake is made in a rhythm, tune or in a dance, they attack the unfortunate one who was guilty of this crime. The cannibals bite pieces of flesh out of his arm, the bears scratch him, and the madman dancers stab him. In very serious cases he may even be killed.

When the people are assembled, one dancer after another enters the house. The ceremony begins in the evening and often lasts until daylight of the following morning. I cannot describe all the masks which appear representing the protectors of the various societies, such as the wolf, the bear, the eagle, and other animals. I will at once proceed to describe those dances or ceremonies which are likely to bring back the novice and which possess a greater interest. Among these are the so-called war dances. Two messengers who are stationed at the door announce the arrival of the dancer by shaking their rattles. At once the singers begin to beat the planks. He enters dressed with an apron of hemlock branches, his trunk is naked except a wide neck-ring of hemlock branches, and he wears a crown of the same material. He carries in his hands a formidable club, the point of which is set with long spikes. He dances around the fire and suddenly drives the spikes of his club into his head and then into his neck. Blood is seen to flow down and he feigns to collapse. Then the medicine men are called up and after some incantations leave him hale and well. This performance is accomplished in the following way: The head-ring and neck-ring are wound around pipes made of the hollow stems of kelp, which are filled with blood. As soon as the spike enters the kelp the blood flows down. Another war dance is managed in a similar manner. The dancer is pierced by a lance—which actually slides back into its handle and which apparently produces a wound at the opposite side of the body.

In still another dance the performer appears naked. Deep gashes are cut in his back through which ropes made of cedar bark are passed. He carries a knife with which he is stabbing his head. Thus he is led about the fire. Then the ropes are passed over the beams of the house and he is pulled up. When he is thus dangling in the air, the madman dancers gather right under the place where he is hanging and hold their lances upright, so that, if the flesh should give way, the war dancer would fall on the lance points and be killed. This cruel performance is gone through, with an astonishing amount of bravery. While the man is hanging from the beams he sings and stabs his head so that the blood flows freely.

When even *this* dance does not bring back the novice, the ghost dance is performed. A person, who, at a former time, was initiated by the ghost, enters the house dancing and singing. By his song he conjures the ghost. Suddenly the earth is seen to open. A skeleton rises from under ground, takes hold of the dancer and drags him down. His friends rush up to him and try to hold him, but in vain. One person, who succeeded in grasping his shoulders, is dragged under ground as far as his elbows, and is then seen to be dragged by his departing friend all through the house, ploughing up the floor with his arms. It is very curious to see him going through the house in this manner. It really looks as though he was being dragged, while in reality he pulls himself along a rope which is buried beneath the floor of the house and is covered with loose dirt. Finally, he lets go his hold. His friend has departed to the under world. Then the voice of the chief of the ghosts is heard to chant right from the middle of the fire. In order to produce this effect, speaking tubes made of kelp are laid from a hidden corner of the house under ground to the middle of the fireplace. After a while, the ground opens again and the dancer reappears from under ground. When he has finished his dance, the people begin a song in his honor. As soon as in this song the word "ghost" is pronounced, a terrible noise is heard on the roof. Four times it moves around on top of the house, then the planks are thrown aside and the novice is seen, pale and haggard. He stretches his trembling hands down into the room crying, *hap*, *hap*, the cry of the cannibal spirit. The people jump up and try to take hold of him, but when they reach the roof he has disappeared again. Now the father announces that, on the following day, the novice will come back.

Early the next morning, the madman dancers assemble in the woods at a clearing which is set aside for their meetings. They are painted with their peculiar designs and wear their weapons. Then they dance and instigate each other to watch for mistakes which may be made and to have no pity upon the guilty ones. The people remain in anxious expectation in their houses awaiting the arrival of the novice. Suddenly his cries are heard on the beach, not far from the village. All rush out of the house, run up to him and hold him. He is in a state of ecstasy and sings the new song which he received from the spirit. The people sit down around him and learn the new song. At the same time they gather hemlock branches which they wind around their heads and around their necks. After they have learned the songs, the men take up a plank on which they beat time to accompany the tune. The women walk ahead and dance in honor of the novice, while he himself goes forward dancing the peculiar cannibal dance. He is surrounded by a number of assistants who shake rattles which are believed to have the effect of quieting him. Thus they slowly approach the village and arrange themselves in front of the dancing house, where the master of ceremonies and his speaker await their arrival. The former has the general charge of the ceremony. He arranges the dances, and now he hails the return of the novice, praising the power of the spirit who initiated him. But the novice is possessed of the desire of devouring men. He does not want to enter the house and all the singing of the people does not avail. Then one of his assistants strips off his clothing and offers to the cannibal his chest, his arms and his legs. He is called "the bait of the cannibal," because he offers himself to him as a bait is offered to a fish. The cannibal bites his arm and is then led into the house. Finally, he bites a piece of flesh out of the arm and then begins his dance. He dances in a squatting position, his arms first extended to the right, then to the left. He tries to attack the people, but is held by two assistants, who hold him by his neck-ring and shake their rattles in order to quiet him. Thus he dances around the fire four times. Then suddenly he disappears and comes forth again, wearing the mask of the spirit which initiated him. The dancer who wears the mask is crouching down and chattering with the movable jaw of the mask, while he shouts at the same time, *hap, hap!* the cry of the cannibal spirit. In this dance the novice personates the spirit which protects him. The two dances are repeated in the same order. During all this time the people sing and dance in order to appease the novice, who is getting more and more quiet, and finally disappears in a room which is set apart for his use. Then his father invites the people to stay in the house and gives them a feast.

Meanwhile, the novice must remain in his secret room. In the evening the people assemble again and he repeats his dances of the morning, again biting the people. In olden times—and that not very long ago—slaves were slain at this occasion and eaten by the new cannibal, who ate the first morsel, to be then joined by the other older cannibals. For four nights these ceremonies are repeated. Then the cannibal has become calmer and his holy fury begins to leave him. He has no further desire for human flesh, and all that remains to be done is to cleanse him. This is a long and elaborate ceremony, which is performed in the dead of night, few witnesses only being admitted. The whole body of the cannibal is washed in a prescribed manner. Then he is wiped and finally smoked. Even after this cleansing he must abstain from many actions. He must not eat with other people, he must not touch the brim of a cup, but drink through the wing-bone of an eagle; he must not go out of the door of the house, but use a separate entrance, until finally, after four months, he is free again to join the rest of his tribe.

In conclusion I wish to make a few remarks on the history of the curious ceremonial which I have here described in hasty outlines. An inquiry into its origin reveals facts which throw a new light upon a great part of the early history of the North American aborigines, and which are also suggestive for a proper understanding of the development of religious ceremonial. I indicated before that the whole ceremonial is based upon legends, many of which convey the impression of great antiquity. Many of the stories which are told to account for the origin of portions of the ceremonial are ancient legends, which we are accustomed to consider as part of the oldest lore of mankind. Therefore the inference seems justified that the greater portion of the ceremonial must be very old.

A comparative study of the fundamental legends shows, however, that this view is quite untenable. When scanning collections of traditions from neighboring tribes and from others who live in remoter territories and to whom the ceremonials of the Kwakiutl are entirely unknown, we find many a one which is in all essential parts identical with those of the Kwakiutl, and very often the weight of the evidence is such that we must assume that the legend was borrowed by the Kwakiutl from a foreign tribe and introduced into the winter ceremonial. I have carried out this inquiry in great detail and reached the conclusion that many of these tales were carried down Columbia River after having crossed the Rocky Mountains. Then they spread along the Pacific Coast until finally they reached the Kwakiutl. But this is not all. There are quite a number of points of resemblance, even of identity, which clearly point to an importation of ideas from Asia. I told before of a story of the magic flight of four brothers, one of whom threw a whetstone, a bottle of oil and a comb over his shoulder, which were transformed into a mountain, a lake and a thicket. In Indian tales we find a fleeing couple throwing earth, water, thorns and fire over their shoulders. We find the same incident in a story from the Scotch Highlands and in another one from the Samoyedes; in fact, it is one of the most widely spread tales of the Old World, and since, in America, it seems to be confined to the North Pacific Coast, which is so near Asia, I conclude that it was imported there from the Old World. We conclude from these facts that the mythology explaining the ritual of the winter dances is not as old as it seems, but brought together from numerous sources and comparatively recently. Although apparently the ritual is based on the myths, it seems that much more probably the myths of foreign peoples were appropriated in order to explain and develop a ritual which originally consisted only of disconnected dances. In order to give it greater weight it was connected with these myths and thus by degrees an elaborate ceremonial and an elaborate mythology developed from insignificant sources, the one sustaining the other. This phenomenon may be observed often in studies of the ceremonials and rituals of mankind, and we may pronounce it a general law that wherever a ritual is found, a mythology will begin to form around it and will in its turn enrich and diversify the ritual.

The geographer, from the study of our small groups of phenomena, derives the conclusion that transmittance of culture by intertribal trade has taken place all over the American Continent and that points of contact between the Pacific Coast of the Old World and of the New World must have existed for very long periods.

THE AMERICAN ASSOCIATION.

The forty-fifth meeting of the American Association for the Advancement of Science was held in Buffalo beginning with the meeting of the Council on Saturday, August 22d. The general sessions opened on Monday and the meeting continued throughout the week until Saturday, which was given to excursions. It is worthy of note that this was the fourth meeting held in Buffalo, the Association having met there every tenth year since 1866.

At the first general session the retiring President, Professor Edward W. Morley, called the meeting to order and introduced the President-elect, Professor Edward D. Cope. Bishop Charles H. Fowler, D.D., pronounced the invocation. The Hon. Edgar B. Jewett, Mayor of Buffalo, delivered the address of welcome from the city, and Professor Cope responded. In the afternoon eight vice-presidents delivered addresses before their respective sections; and in the evening the retiring President gave a learned address before the Association on the subject, "A Completed Chapter in the History of the Atomic Theory."

Vice-President B. K. Emerson, of Amherst, Mass., chose for the subject of his address before the Section of Geology and Geography, "Geologic Myths." He announced that he would speak of "The Chimaera, or the poetry of petroleum; of the Niobe, or the tragic side of calcareous tufa; of Lot's wife, or the indirect effect of cliff erosion; and of Noah's flood, or the possibilities of the cyclone and the earthquake wave working in harmony."

The myth of the Chimaera, he said, was told in its earliest form by Hesiod, who lived about nine centuries before the Christian era; and a little later by Homer. In each of these verses, which he quoted, the Chimaera is represented as a huge monster having the head of a goat, the body of a lion and the tail of a serpent, from whose mouth and nostrils issue flames of fire. Tracing the origin and development of this myth, Professor Emerson showed that it was derived from the remarkable geological phenomenon of natural gas burning on the peak of a mountain of serpentine and limestone in Lycia. This burning mountain was seen by Admiral Beaufort while off the coast of Lycia toward the end of the seventeenth century; and according to tradition it has burned there for nearly 3,000 years. "Ruins of an ancient temple of Vulcan near by and a little Byzantine church show how strongly it has impressed the inhabitants in all ages." The Phœnician word Chimaera means burning mountain; the Greek word for goat has nearly the same sound; and in this way came about the myth of "a goatlike form vomiting flames and ravishing in the mountains of woody Lycia."

In tracing the myth of Niobe, the Professor said, "As one climbs from the Gulf of Smyrna, between Mount Tmolus and Sipylus, . . . high up in the vertical limestone, there appears the colossal bust of a woman standing on a high pedestal and in a deep alcove. It is cut out of the living rock, like the Swiss lion at Lucern." This is the "almost prehistoric" statue of the great Mother Cybele or the Mētēr Sipylene—gods of the Phœnicians—and is the origin of the Niobe myth. The dripping of the water from the limestone roof of the alcove has caused the "stalagmite tears" and the masses of rock dislodged from the cliffs around her by the action of the sun and rain are her children, slain by the arrows of Phœbus. From this geological phenomenon acting on the ancient stone sculpture the poetic mind of the Greek created the myth of Niobe weeping for her children.

The column of salt, known as Lot's Wife, is still standing in the Dead Sea. It owes its origin to geological changes in that region; and it owes its continuation to the action of the erosion. The name is supposed to be derived from some old word having the sound of Lot's wife.

The Professor gave an erudite history of the Flood myth, tracing it through all times and countries, and showing its remote antiquity by the statement that in the annals of the Babylonians, which can now be traced back 3800 B. C., no certain account of a flood has yet been found. In demonstrating that all these flood myths arise from natural geological phenomena, he recalled various similar catastrophes in modern times, such as the last terrible earthquake waves in China and Japan.

Miss Alice C. Fletcher of Washington, D. C., Vice-President of the Section of Anthropology, spoke on "Emblematic use of the Tree in the Dakotan Group." The tribes of the Dakotan or Siouan linguistic stock aggregate in number about 45,000 Indians. Certain tribes of this stock, at the beginning of the seventeenth century, occupied a strip of land along the Atlantic Coast, now within the limits of North and South Carolina, and were gradually driven west by their warlike neighbors, the Algonquins and Iroquois, becoming extinct as tribes within the historic period. The rites, and customs of the Siouan Indians were necessarily influenced by contact with other tribes during their wanderings; but the eastern, southern and western tribes seem to have been under the influence of certain religious cults which were fundamentally the same. These religious ideas were important factors in organizing the tribal structure. The Indian religions, like those of the Eastern Continent, seem to start from the utterance of a seer; and it is this idea which always forms the vital spark of the religion, no matter how much it is encrusted in superstitions and ceremonies. Belief in animism is common among the Indians, as well as its accompanying belief in the continuity of life in the hereafter. The mysterious power to which the Indian addressed his prayers was called in the Omaha and Ponka tribes, Wa-ka*n*-da, meaning to bring to pass. The Indian believed that this power pervades all nature, animate and inanimate, and therefore to him "all things became anthropomorphized." An old Indian once said to Miss Fletcher, "The tree is like a human being, for it has life and grows, so we pray to it and put our offerings on it, that the mysterious power may help us." To the rock he prayed for long life. He believed also that after a period of privation, fasting and prayer, a manifestation of this mysterious power would come to him in a vision. The form of this vision was ever after the totem of his clan, for men having similar visions affiliated into societies or gentes. This was an important step in social development. The Thunder gentes, from the nature of the manifestation, were always the most authoritative; thunder itself being the god of war. In the Omaha tribe the Sacred Tent of War was set aside for the ceremonies connected with Thunder; and in this tent among other things was the cedar pole, called Wa-ghdhe-ghe, meaning the power to bestow honours. The abode of the Thunder Birds was supposed to be in the cedar tree. The honours bestowed were thos efor bravery in war. The next important step in the social progress of these tribes is marked by the Omaha ceremony of the He-di-wa-chi, "one of the simplest and probably oldest ceremonies to draw the people together and unite them into an organized body." In this too the tree was the sacred object,—the pole about which the people danced,—the recognized symbol of the all-powerful Thunder, which in turn was the manifestation of the mysterious power, Wa-ka*n*-da. Later, when the Omaha ceremony of the Sacred Pole was established, the name, Wa-ghdhe-ghe, which had been given to the cedar pole in the Tent of War, was applied to the Sacred Pole; but the honours bestowed were those won in peace; for, according to the legend, "The ceremonies of the Sacred Pole were devised to hold the people together."

In the Section of Geology and Geography a special meeting was held to commemorate the sixtieth anniversary of Professor James Hall's connection with the Geological Survey of the State of New York, and to take public recognition of his long-continued and valuable scientific work. The venerable and distinguished scientist, who is one of the founders of the Association, was present at the meeting and responded to the addresses made in his honour.

A paper which excited general interest was that read by Rev. Horace C. Hovey of Newburyport, Mass., on "The Making of Mammoth Cave," embodying some of the results of his recent explorations in Kentucky. Mr. Hovey has had thirty years' experience in cave exploration, and he described in glowing words the beauties and dangers of such experience. With the coöperation of Dr. R. E. Call, he has reëxplored nearly all of the 200 avenues, rooms, pits and domes of Mammoth Cave. The depth of these pits has been so much exaggerated that Mr. Hovey's party undertook the dangerous and difficult task of sounding them to obtain accurate measurements. The so-called Bottomless Pit was found to be 105 feet in depth. The whole region of about 8,000 square miles, in the midst of which Mammoth Cave and many other similar caverns are found, owes its present form, he said, to simple erosion. The great size of the cave is due to the fact that it comprises many caves and grottoes whose walls have been worn away, and also to the absence of natural causes that usually destroy underground passages. The layer of sandstone overlying the limestone from which the cave is excavated is the cause of the scarcity of stalagmites. The pits and domes play an important part in forming the cave; and it has been considered by eminent authorities that they were made by the action of whirling water and pebbles from above downward. Mr. Hovey gave good evidence that they were caused by solution through the agency of acidulated water. The subterranean rivers, although easily navigable in summer, are combined in winter into a mighty rushing current, which is a powerful agent in hollowing out the long horizontal passage ways and undermining the arches, thus making the successive galleries for which the cave is noted. Mr. Hovey's conclusions are that none of the ordinary causes of cave-making, such as whirling water and pebbles, have had much to do with the making of Mammoth Cave; he believes that it has been made almost entirely by the chemical and mechanical action of water.

Mr. Hovey read another paper on the newly-discovered cave, not far from the Mammoth Cave, called the "Colossal Cavern."

This remarkable cave was discovered by Mr. Pike Chapman in 1895. It is of great size, and is supposed to be connected in a circuitous way with Mammoth Cave. It is attracting much attention, but has been as yet only partially explored.

As in previous meetings at Buffalo, the subject of Niagara Falls naturally claimed much time and attention. Many papers bearing upon the various aspects of the subject were represented in Section E. Mr. G. K. Gilbert, of the United States Geological Survey, gave three papers, as follows: "The Algonquin River," "The Whirlpool, Saint David's Channel," and "Profile of the bed of the Niagara in its Gorge."

One of the public lectures given by the Association to the citizens of Buffalo was on "Niagara as a Time Piece," by Dr. J. W. Spencer, of Washington, D. C. The age of Niagara has been estimated for the past 100 years by dividing the length of the gorge by the supposed rate of recession. In early times this was chiefly by guess, but we now have correct measurements of the modern rate of recession obtained by comparison of surveys of the Cataract. These show that Horseshoe Falls has a mean annual recession of a little more than four feet. Many other factors must enter into a calculation of the age of the Falls, among which is the fact that the recession in the past was from natural causes slower than in the present. Taking everything into consideration, Dr. Spencer considers Niagara as the best chronometer, although imperfect, of geologic time. It is also of great interest in connection with the glacial period and the antiquity of man.

This lecture, together with the papers in Section E, served as excellent preparation for the enjoyment of the day's excursion to Niagara Falls and Gorge, which was planned by the local committee for the benefit of the Association.

Dr. D. G. Brinton presented in Section H the following resolution: "Whereas, the influence which the environment of the New World has exerted upon the physical and mental development of the white race is a question of the utmost scientific and practical importance; and whereas, there appears to be no governmental or scientific bureau which is giving this subject attention at the present time; therefore, Resolved, That the A. A. A. S. appoint a committee to organize an ethnographical investigation of the white race in the United States with special reference to the causes exerted upon it by its new surroundings; said committee to report annually to the Association." The resolution was adopted by the Association, and the following committee was appointed: D. G.

Brinton, J. McKeen Cattell, W. W. Newell, W. J. McGee and Franz Boas.

Professor F. W. Putnam gave a talk in Section H on the Recent Explorations in Honduras by the Peabody Museum. For the past five years explorations have been carried on at the Ruins of Copan, and the Museum has the exclusive right to continue these explorations for five years to come. The first attempt at extensive excavations on the sites of the ancient cities of Central America and Yucatan was made by the expeditions from this Museum. Although the huge stone monuments and sculptures, described by Stephens and later by Maudslay, are undoubtedly very old, explorations beneath the surface have brought to light evidence of far greater antiquity.

Professor G. Frederick Wright, of Oberlin, Ohio, presented "Fresh Geological Evidence of Glacial Man at Trenton, New Jersey." This evidence was based on the explorations of Mr. Ernest Volk, now carried on under the direction of Professor Putnam for the American Museum of Natural History. At a place called Lalor's Field, in the presence of Professor Wright, a trench was dug in order to show the several strata. In the top layer of black soil, about one foot in thickness, were potsherds, broken and perfect implements of chert, jasper, quartz, quartzite and argillite. The stratum below the black soil is composed of yellow glacial sand, varying from one to three feet in thickness. In this glacial sand, chips and broken argillite implements were found, and a few fire-split quartzite pebbles. Below this stratum is one of yellowish white sand, six inches thick, resting on the red clay. The important conclusion to be drawn from this and other similar excavations is the fact that in the *glacial* sand deposit only argillite implements are found, while in the soil above are all the objects characteristic of the later or "Indian" occupation. This early use of argillite by the people of glacial, and probably of pre-glacial time, has received many confirmations since first pointed out by Dr. Abbott; and the evidence now presented by Mr. Volk's most recent exploration is of special interest and importance in connection with Glacial Man.

Professor Putnam supplemented this paper with remarks corroborating the above statements and exhibiting a small collection which was taken from another trench in the same region.

Professor E. W. Claypole, of Akron, Ohio, read a paper on "Human Relics in the Drift of Ohio." His conclusion is that the finding of several implements in the drift of Ohio during the past few years strengthens the belief in the co-existence of man with the ice sheet in north central Ohio.

Mr. E. O. Hovey, of New York, read a paper on the Artesian well sunk at Key West, Florida, in 1895. In boring to a depth of 2,000 feet it was found that the upper layer of 50 feet was of limestone formed of coral *in situ*, but below that the limestone was of sedimentary origin, chiefly beach sand. This is evidence in favor of the theory that the Florida peninsula is not composed mainly of natural coral formation.

Mr. J. E. Todd spoke of the "Hydraulic Gradient of the Main Artesian Basin of the Northwest." The largest known artesian area is that which extends from Nebraska and Dakota to the Rocky Mountains and about a thousand miles north and south. The water is contained in the clayey layers of the Dakota sandstone overlaid by impervious clays and shales. The pressure of the water increases with the depth of the layer; it is also greater toward the western part of the area. The variation of pressure at the same level is due to leakage. The pressure is sometimes 200 pounds to the square inch, and at Huron, South Dakota, the water rises 400 feet above the surface.

In consideration of the fact that the British Association for the Advancement of Science will hold its meeting of 1897 in Toronto, beginning on August 18, the American Association has decided to accept the invitation of the City of Detroit and to begin its meeting on August 9. This time and place will enable the members of each association to attend the meetings of the other. A cordial invitation has been extended to the members of the British Association to become the guests of the American Association, and a most courteous invitation has been received by the American Association from the Toronto Committee to join in the meeting at Toronto.

The President-elect for 1897 is Dr. Wolcott Gibbs, Professor Emeritus of Harvard University. In 1898 the Association will celebrate its fiftieth anniversary. At the Buffalo meeting much interest was shown in this anniversary meeting, which will be one of the great scientific events of the century in America.

A GRAPHIC HISTORY OF THE UNITED STATES.

BY

HENRY GANNETT.

This is not a history of the Government or of the people of the United States, but an outline, expressed mainly by means of maps, of the changes in the territory of the country as a whole and of the different States since it became one of the powers of the earth.

Upon the conclusion of the treaty of peace with Great Britain, at the close of the War of Independence, our home was limited on the south by the 31st parallel of latitude, and the present northern boundary of Florida. The western limit of our jurisdiction was the mid-channel of the Mississippi River, and from its source a line run due north to the Lake of the Woods. The area of our domain was then 827,844 square miles, or less than a fourth what it is at present.

At that time our territory consisted of the 13 original States, which then comprised, besides their present areas, those of Maine, Vermont and West Virginia. Between the western limits of the original States and the Mississippi River stretched a region practically unsettled, which was claimed by these States. Georgia claimed the territory between the 31st and 35th parallels, which now constitutes most of Alabama and Mississippi; North Carolina claimed what is now Tennessee; Virginia claimed what is now Kentucky, together with an extensive region in Ohio, Indiana and Illinois. New York, Connecticut and Massachusetts also claimed territory in the region north of the Ohio, their claims, with those of Virginia, overlapping one another in a perplexing manner.

As the simplest method of settling these claims, the States ceded their western territories to the United States, with the single exception of the area which is now Kentucky, which, instead of being ceded, was erected into a State. These cessions were made by the several States between 1781 and 1802. The area north of the Ohio was in 1788 organized as the Territory Northwest of the River Ohio. The area now constituting the State of Tennessee, although never organized as a Territory, was known as the Territory South of the River Ohio. The State of Tennessee was created in 1796.

LOUISIANA PURCHASE.

Settlement at that time was confined mainly to the Atlantic coast and did not extend far inland, and when, in 1803, Bonaparte offered to sell us that great tract of land which lay west of the Mississippi for a song, no thought of the need of the land itself for our expanding population was in the minds of our legislators when they closed with his offer. They thought of the free and unrestricted navigation of the Mississippi River from its head to its mouth, and it was mainly, if not entirely, for this that they paid the price and received the deed. The price paid was $12,000,000, and the assumption by the United States of certain claims which its citizens had against the French Government, known as the French Spoliation Claims, the total amount of which was estimated at $3,750,000.

Louisiana comprised all the basin of the Mississippi River upon the west side of the main stream as far south as the head of the Arkansas in Colorado. From this point the boundary line followed the Arkansas River eastward to the 100th meridian, thence south along this meridian to Red River, and down Red River to what is now the west boundary of Louisiana, which it followed to the Gulf. The area is estimated at 897,931 square miles.

With the acquisition of Louisiana came that of Oregon, which originally comprised not only the present State of Oregon, but Washington, Idaho, and a small part of Montana. Since we had, by purchase, acquired all the country east thereof, this region, which was practically without an owner, fell naturally into our hands.

The entire area thus acquired, including Louisiana and Oregon, comprised 1,171,931 square miles, an area much greater than our original territory.

THE FLORIDAS.

The east boundary of Louisiana, in the extreme south, was indefinite, and for many years after its acquisition was a bone of contention between this country and Spain, which at that time was the owner of the Floridas. This was settled in 1819 by their purchase from that country. The area thus obtained was 59,268 square miles, and the price was $5,000,000.

TEXAS.

In 1845 Texas, which several years before had achieved her independence of Mexico, sought and obtained admission to the United States. At that time its limits west of the 100th meridian extended north to the Arkansas River and west to the Rio Grande, and this accession of territory increased our area by 375,239 square miles.

FIRST MEXICAN CESSION.

Then followed the war with Mexico, one result of which was the acquisition by the United States in 1848 of what is known as the First Mexican Cession, which comprised the present areas of California, Nevada and Utah and parts of Wyoming, Colorado, New

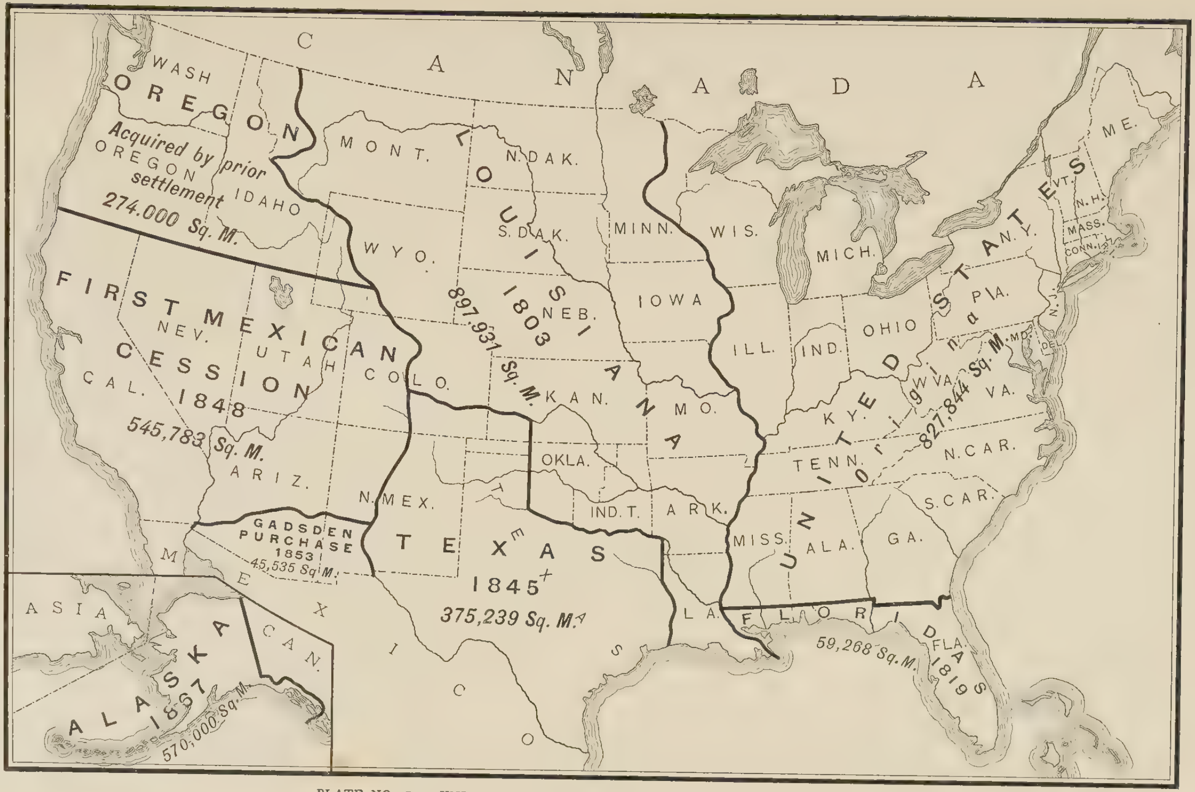


PLATE NO. I. UNITED STATES, SHOWING ACCESSIONS OF TERRITORY.

Mexico and Arizona. The area of the cession was 545,783 square miles and the price paid therefor was $15,000,000.

GADSDEN PURCHASE.

Five years later another addition was made, known as the Gadsden Purchase, which is now in New Mexico and Arizona. The area of this purchase was 45,535 square miles and the price paid was $10,000,000. This purchase completes the main body of our country, the only other cession of territory being that of Alaska, which was purchased from Russia in 1867 for $7,200,000.

The above facts are summarized in the following table, showing the cessions of territory, with their dates, areas, and the prices paid therefor, and the limits of these different cessions are shown graphically on the map constituting Plate No. 1.

ACCESSIONS OF TERRITORY.

	YEAR.	AREA.	COST.
Original area	....	827,844	....
Louisiana	1803	897,931	$15,750,000
Oregon	....	274,000	....
Florida	1819	59,268	5,000,000
Texas	1845	375,239	....
First Mexican Cession	1848	545,783	15,000,000
Gadsden Purchase	1853	45,535	10,000,000
Alaska	1867	570,000	7,200,000
Total		3,595,600	

HISTORY OF THE STATES.

The Government was organized by 13 States. Since then 32 others have been formed and admitted, and these 45 States, with 4 Territories, the District of Columbia and Indian Territory, make up the entire country. Of the 13 original States, 9, namely, New Hampshire, Rhode Island, Connecticut, New Jersey, Pennsylvania, Delaware, Maryland, and North and South Carolina, have not been changed since the adoption of the Constitution, excepting perhaps to a trifling extent by reason of adjustment of boundary lines, or, in the case of Maryland, by the formation of the District of Columbia and of Pennsylvania by the addition of what is now part of Erie County. The other 4, namely, Massachusetts, New York, Virginia and Georgia, have been greatly changed, Massachusetts by the loss of the District of Maine; New York by being shorn of Vermont; Virginia by the formation of West Virginia and Kentucky, and Georgia by the formation of Alabama and Mississippi.

Of the 31 States which have been admitted, 8, namely, Florida, Alabama, Kentucky, Tennessee, Montana, Wyoming, Colorado and California, have not been changed in area since they first appeared, whether as States or Territories. All the others have been changed in area since the organization of the Territory, and many of them have sustained numerous changes of area, so that their history is somewhat complex.

Of these 32 States, 4, namely, Tennessee, Kentucky, Ohio and California, never were organized as Territories, at least under those names. Louisiana was a Territory under the name of Orleans, and North and South Dakota under the name of Dakota.

The following table summarizes the above facts and gives the years of the organization of the Territories and the admission of the States:

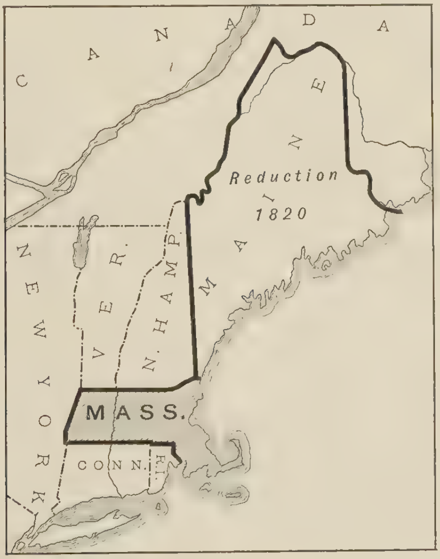
	ORGANIZATION OF TERRITORY.	ADMISSION OF STATE.	AREA.
1. Alabama	1817	1819	Unchanged.
2. Arizona	1863	....	Changed.
3. Arkansas	1819	1836	“
4. California	....	1850	Unchanged.
5. Colorado	1861	1876	“
6. Connecticut	....	Original	“
7. Delaware	....	“	“
8. District of Columbia	1790	....	Changed.
9. Florida	1822	1845	Unchanged.
10. Georgia	....	Original	Changed.
11. Idaho	1863	1890	“
12. Illinois	1809	1818	“
13. Indiana	1800	1816	“
14. Iowa	1838	1845	“
15. Kansas	1854	1861	“
16. Kentucky	....	1792	Unchanged.
17. Louisiana	1804 (Orleans.)	1812	Changed.
18. Maine	....	1820	Unchanged.
19. Maryland	....	Original	“
20. Massachusetts	....	“	Changed.
21. Michigan	1805	1837	“
22. Minnesota	1849	1858	“
23. Mississippi	1798	1817	“
24. Missouri	1812	1821	“
25. Montana	1864	1889	Unchanged.
26. Nebraska	1854	1867	Changed.
27. Nevada	1861	1864	“
28. New Hampshire	....	Original	Unchanged.
29. New Jersey	....	“	“
30. New Mexico	1850	....	Changed.
31. New York	....	Original	“
32. North Carolina	....	“	Unchanged.
33. North Dakota	1861 (Dakota.)	1889	Changed.
34. Ohio	....	1803	“

	ORGANIZATION OF TERRITORY.	ADMISSION OF STATE.	AREA.
35. Oklahoma	1889	....	Changed.
36. Oregon	1848	1859	"
37. Pennsylvania	....	Original	Unchanged.
38. Rhode Island	....	"	"
39. South Carolina	....	"	"
40. South Dakota	1861 (Dakota.)	1889	Changed.
41. Tennessee	....	1796	Unchanged.
42. Texas	....	1845	Changed.
43. Utah	1850	1896	"
44. Vermont	....	1791	Unchanged.
45. Virginia	....	Original	Changed.
46. Washington	1853	1889	"
47. West Virginia	....	1863	"
48. Wisconsin	1836	1848	"
49. Wyoming	1868	1890	Unchanged.

In the following pages is given the history of each of those States whose area has been changed since its organization as a Territory. The main facts of the history are expressed by the maps which appear as cuts. In each one the shaded area is that of the present State, while the original area is surrounded by a heavy outline. The additions and reductions in area are so indicated upon the maps.

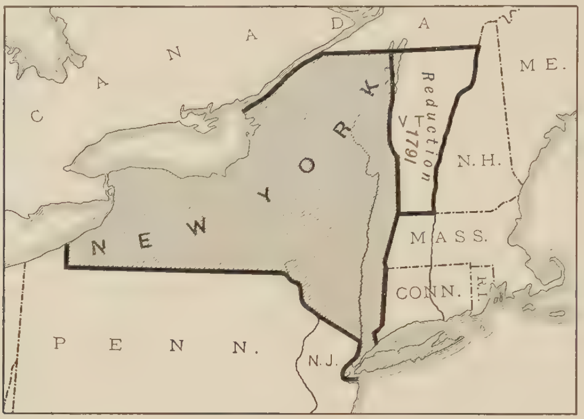
MASSACHUSETTS.

This State originally included Maine, which was cut off from it and made an independent State in 1820.



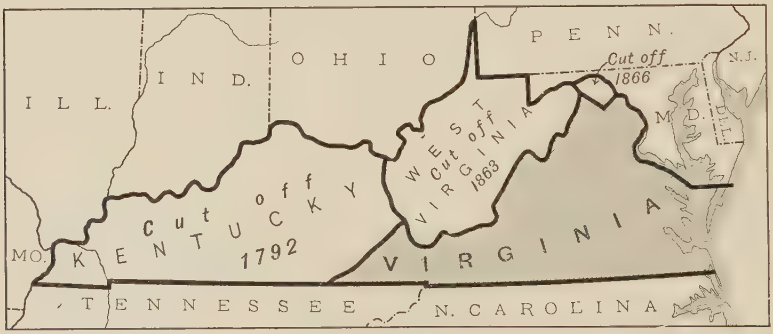
NEW YORK.

New York originally included Vermont, which was separated from it and made a State in 1791.



VIRGINIA AND WEST VIRGINIA.

Virginia originally included the areas of Kentucky and of West Virginia. In 1792 Kentucky was taken from it and made an independent State, and in 1863, in the midst of the civil war, West Virginia was cut from Virginia and admitted by itself. Three years later two counties more were taken from Virginia and added to West Virginia.

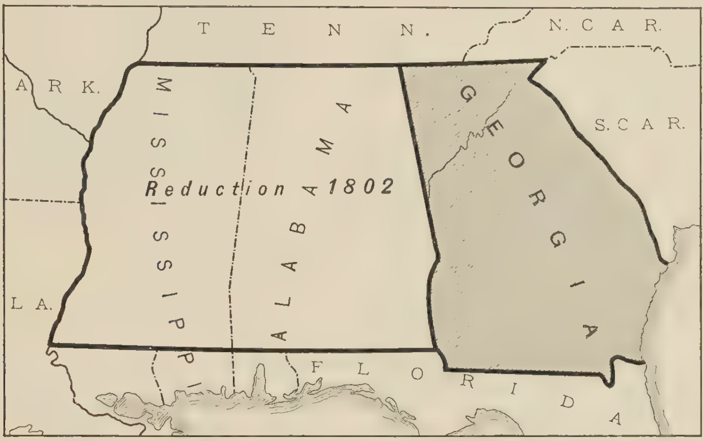


DISTRICT OF COLUMBIA.

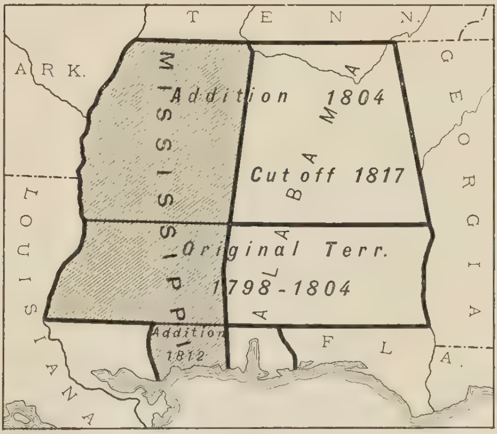
This tract, the seat of the General Government, was originally 10 miles square, part of which was ceded by Maryland in 1788, and part by Virginia the following year. The Virginia part was re-ceded to that State in 1846. It was accepted by the United States and adopted as the seat of government in 1790.

GEORGIA.

This State originally extended from the Savannah River to the Mississippi, and from its present southern boundary to the 35th parallel. In 1802 it ceded the country west of its present western limits to the United States.



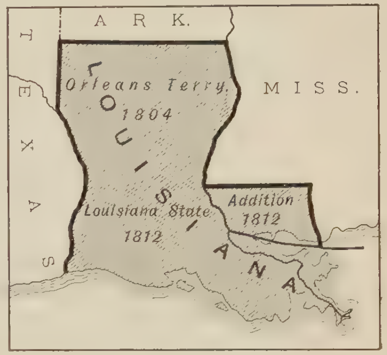
MISSISSIPPI.



The original Territory of Mississippi was formed from a part of the lands ceded by Georgia to the General Government. It extended from the western boundary of Georgia to the Mississippi River, and from the 31st parallel to a parallel passing through the mouth of the Yazoo River. The limits of this territory were extended northward in 1804 to the 35th parallel, so that it then comprised the present area of Mississippi and Alabama, with the exception of those parts lying south of the 31st parallel. This territory was reduced in 1817 by the formation of Alabama Territory, which comprised the present area of the State of Alabama, and was increased at the same time by that portion of the present State of Mississippi which lies south of the 31st parallel.

This gave the Territory its present limits, and with these limits it was admitted as a State in 1817.

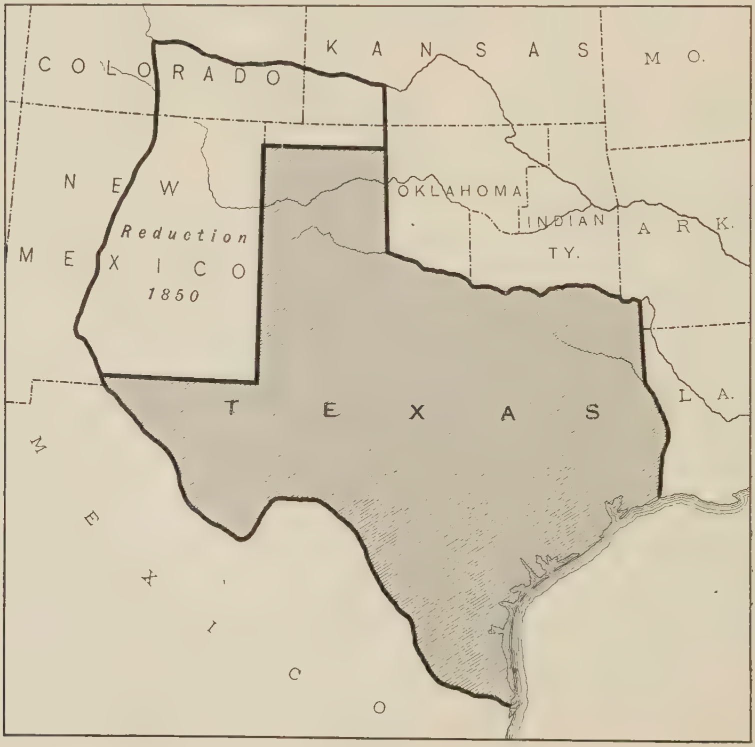
LOUISIANA.



In 1804 a portion of the Louisiana purchase, comprising the present State of Louisiana, with the exception of a small area in the southeastern part, was organized as a Territory under the name of Orleans. In 1812 it was admitted as a State under the name of Louisiana, and in the same year it was enlarged to its present limits.

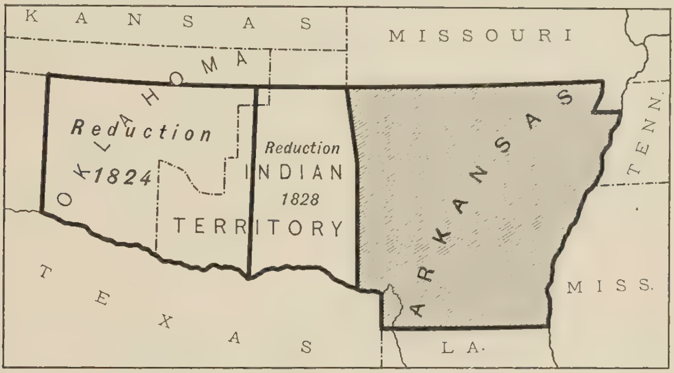
TEXAS.

This State declared its independence of Mexico in 1835, and ten years later was admitted into the United States as a State. When admitted it extended on the west to the Rio Grande, and on the north, west of the 100th meridian to the Arkansas. In 1850 it sold to the United States, for $10,000,000, the regions north and west of its present limits, which are now in New Mexico, Colorado, Kansas and Oklahoma.



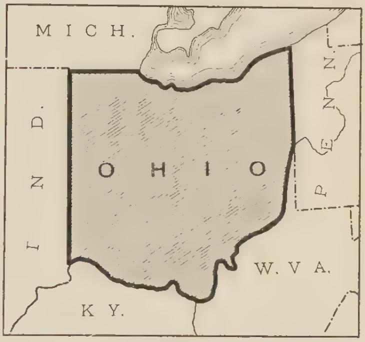
ARKANSAS.

Arkansas was originally a part of Missouri Territory, and was set off in 1819. The territory then extended west to the 100th meridian, our western territorial line. This area was reduced in 1824 and again in 1828, when the present limits were established. It was admitted in 1836.



OHIO.

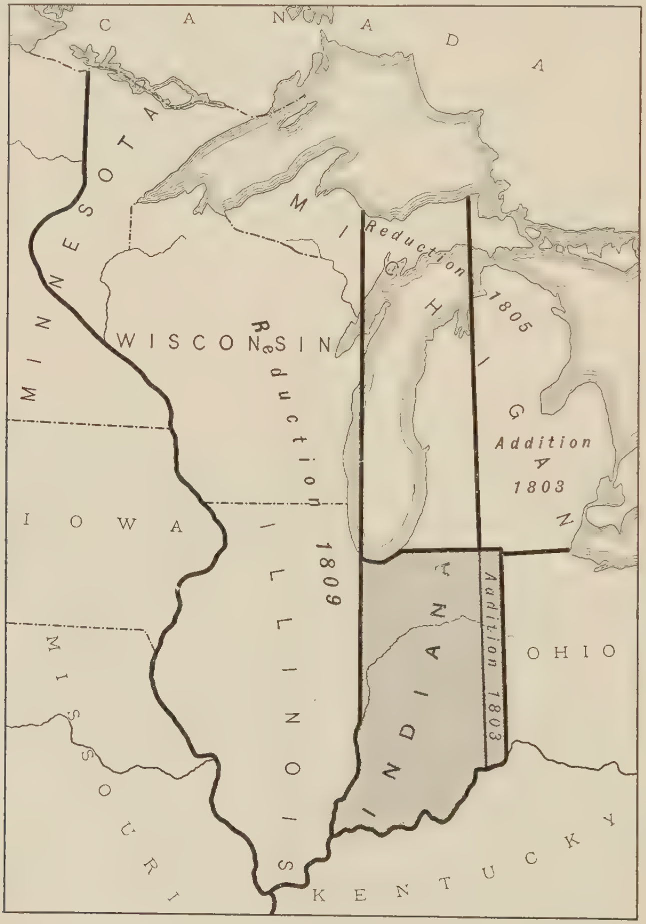
The territory northwest of the River Ohio was divided in 1800, the division line being a meridian through the mouth of Kentucky River. The western part became Indiana Territory, while the eastern part remained Northwestern Territory. In 1803 the part of this south of a parallel of latitude tangent to the south end of Lake Michigan and east of a meridian through the mouth of Great Miami River, was admitted as a State under the name of Ohio. The remainder of the Northwestern Territory was added to Indiana Territory.



Ohio was slightly increased in 1836, the northern boundary being changed to a great circle, running from the south end of Lake Michigan to the head of Maumee Bay. This change is too small to be represented on the map.

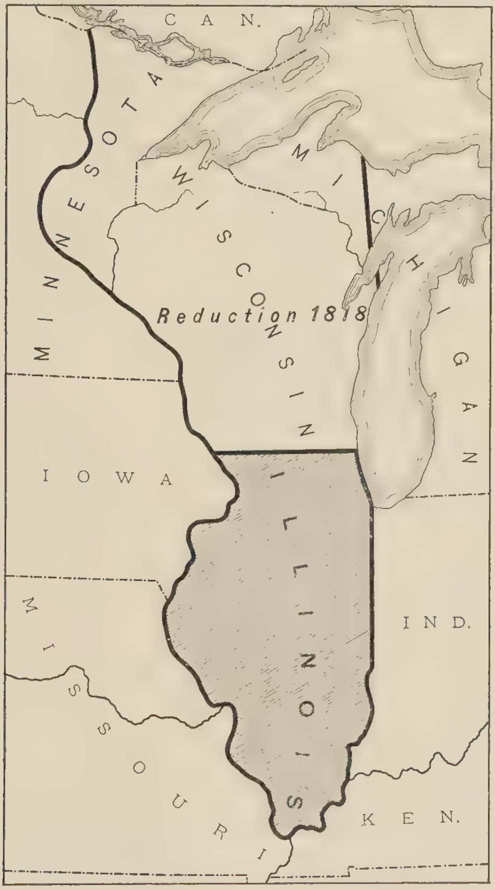
INDIANA.

The Territory of Indiana was created in 1800, and comprised that part of the Northwest Territory lying west of a meridian passing through the mouth of Kentucky River. This was increased in 1803 by the addition of that part of the Northwest Territory remaining after the formation of Ohio. In 1805 the portion north of its present northern boundary and east of its present western boundary prolonged northward was set off as Michigan Territory, and in 1809 all the remainder of the territory outside of the present limits of the State became Illinois Territory. It was admitted in 1816.



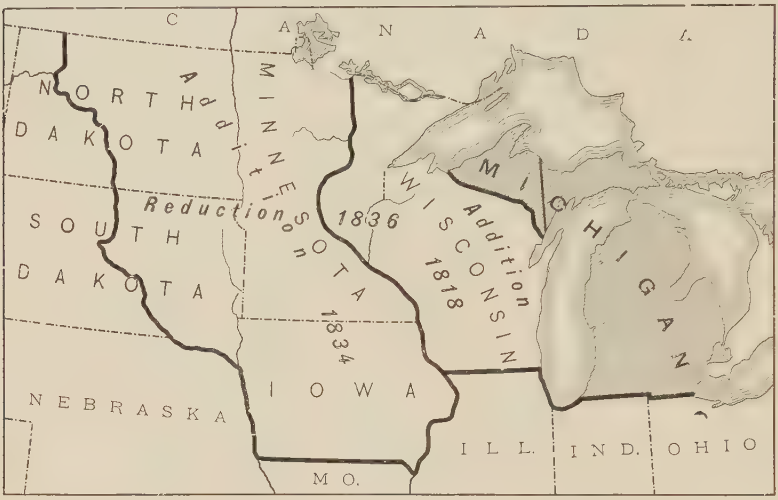
ILLINOIS.

Illinois Territory, originally a part of Northwestern Territory and then of Indiana Territory, was organized in 1809. In 1818, upon its admission as a State, the portion north of its present limits was cut off and added to Michigan Territory.



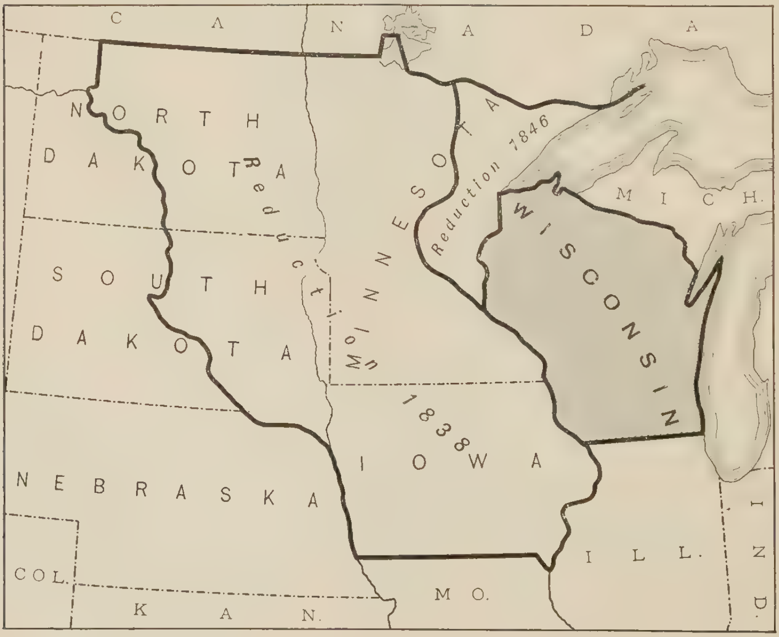
MICHIGAN.

Michigan Territory was organized in 1805, and then comprised its present area, except the western portion of the upper peninsula. In 1818, its limits were extended westward to the Mississippi River, and in 1834 to the Missouri River. In 1836, it was reduced to its present limits, the portion cut off forming Wisconsin Territory, and in 1837 it was admitted as a State. A trifling change was at the same time made in its southern boundary.



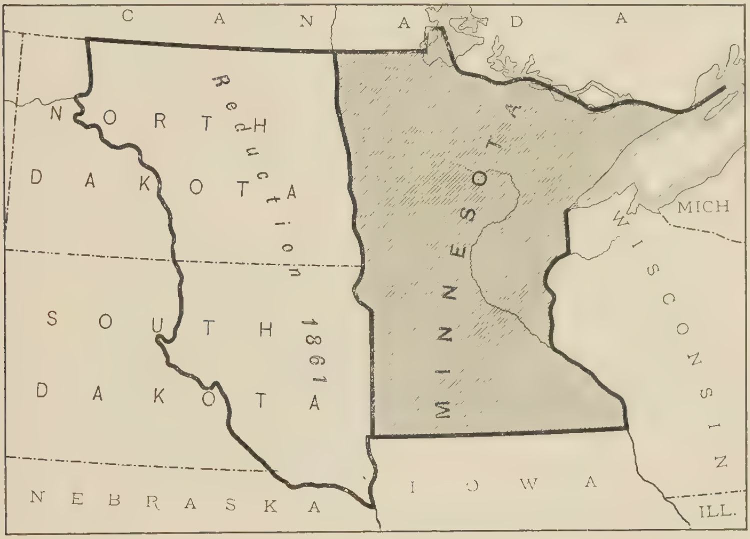
WISCONSIN.

The Territory was organized in 1836 from part of Michigan Territory. It was reduced in 1838 by the formation of Iowa Territory, and again in 1846, the area cut off at that time becoming a part of Minnesota in 1849. It was admitted as a State in 1848.



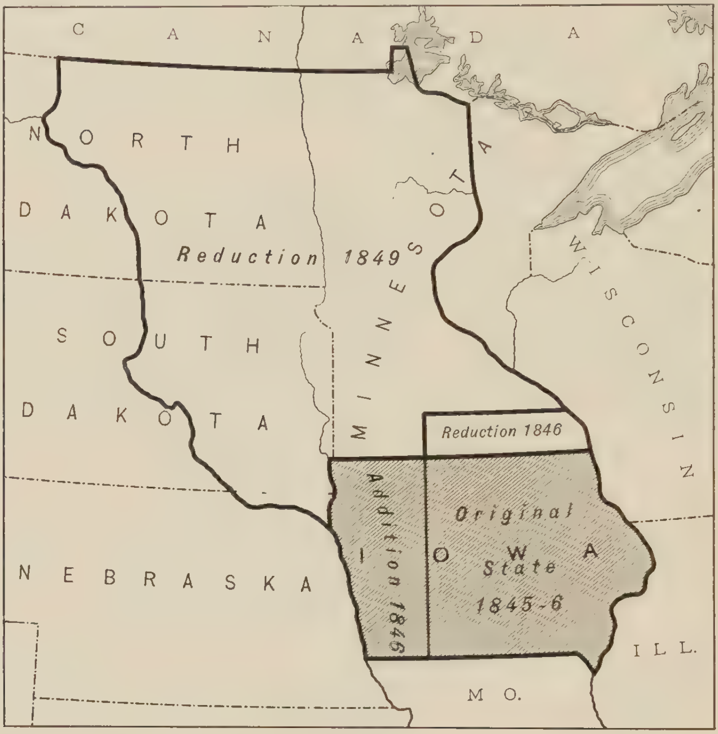
MINNESOTA.

The Territory was organized in 1849 from parts of Iowa and Wisconsin Territories. It was admitted in 1858 with its present limits, and in 1861, the area outside these limits was included in Dakota.



IOWA.

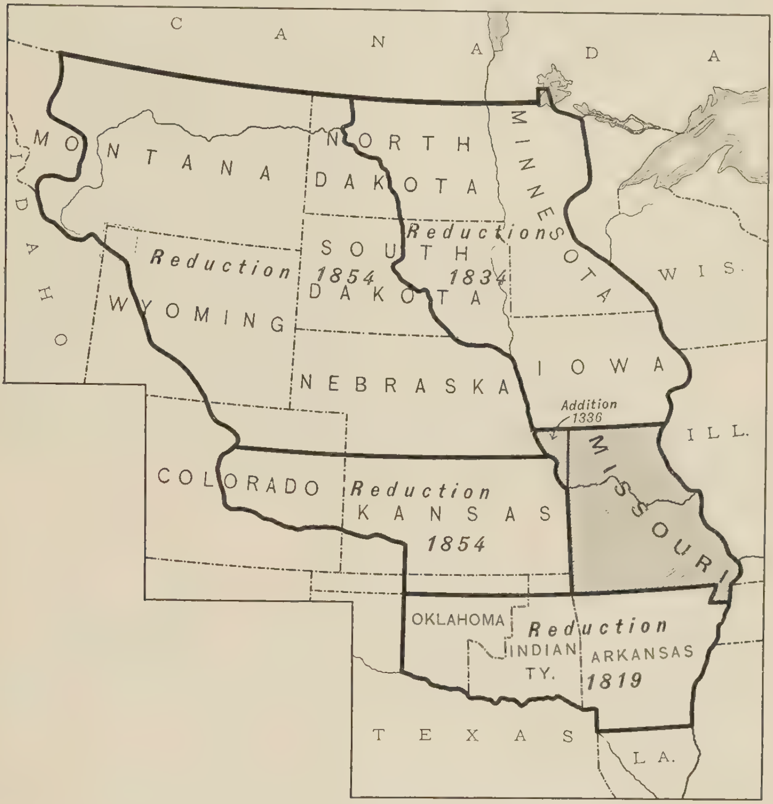
This Territory was organized in 1838 from a part of Wisconsin Territory. In 1845, it was admitted as a State, but with limits very different from those at present, as it extended northward to the bend of Minnesota River, while its western boundary was much farther east than now. In 1846, its boundaries were changed to those which it has to-day. In 1849, the remaining portion of Iowa Territory was annexed to Minnesota Territory.



MISSOURI.

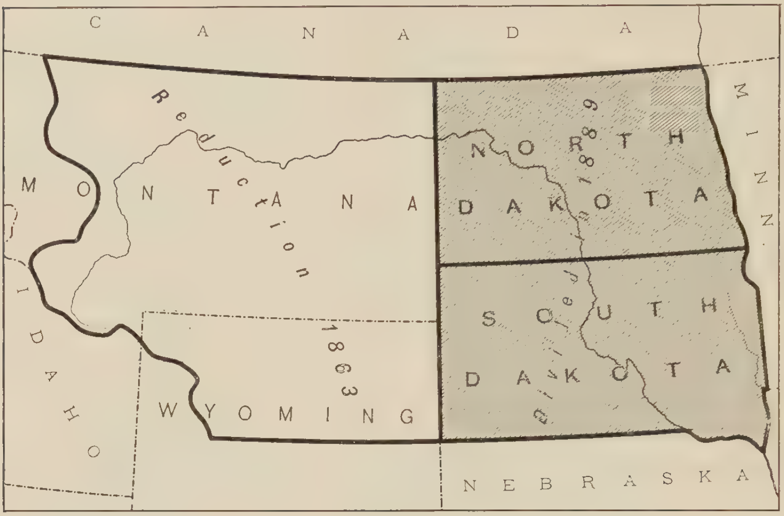
In 1812, upon the organization of Orleans Territory, the remainder of the Louisiana purchase became Missouri Territory. Out of this great area, the Territory of Arkansas was carved in 1819, and in 1821 the State of Missouri was formed and admitted, with the limits as at present, excepting that the northern part of the western boundary was then a meridian through the mouth of Kansas River, instead of following the Missouri River. The change to its present boundaries was made in 1836.

Meantime, the name Missouri Territory continued to be applied to the remaining area. In 1834, the part of it lying east of the Missouri and White Earth rivers became a part of Michigan Territory, and in 1854 other parts became Kansas and Nebraska Territories, absorbing the remainder, with the exception of a narrow strip lying between Kansas and Indian Territory, which had been assigned to certain Indian tribes, and became part of Indian Territory and subsequently Oklahoma.



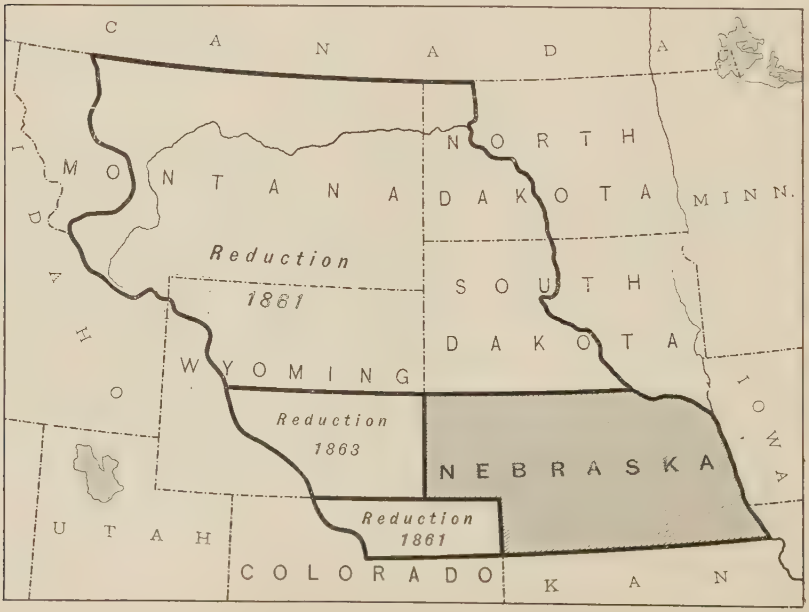
NORTH AND SOUTH DAKOTA.

Dakota Territory was formed in 1861 from parts of Minnesota and Nebraska Territories. The formation of Idaho Territory in 1863 reduced it nearly to its present dimensions, and in 1882 a small area in the southeast was transferred to Nebraska, completing the reduction. In 1889 it was divided into North and South Dakota, and they were admitted as States.



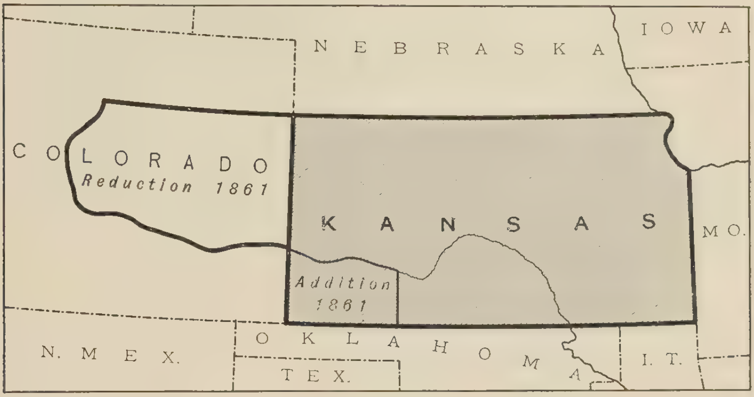
NEBRASKA.

The Territory was formed in 1854, from the northwestern part of Missouri Territory. In 1861 Colorado and Dakota Territories were formed, taking away most of its area and reducing it nearly to its present limits. It was admitted in 1867. In 1882 a small addition was made to it on the north by the transfer of a small tract from Dakota.



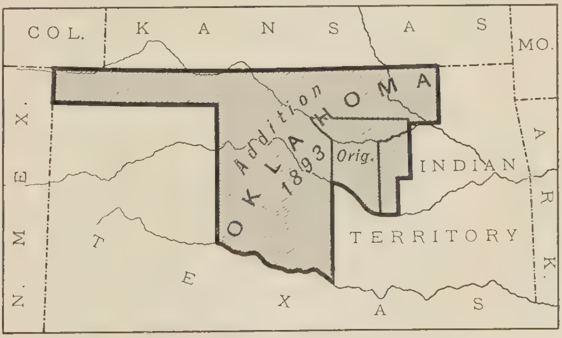
KANSAS.

Kansas Territory was organized in 1854 from part of Missouri Territory. Its western boundary was originally the 100th meridian, the Arkansas River, and the continental divide. In 1861 it was admitted as a State, its area being increased by the addition of the southwest corner, and reduced by the part now in Colorado.



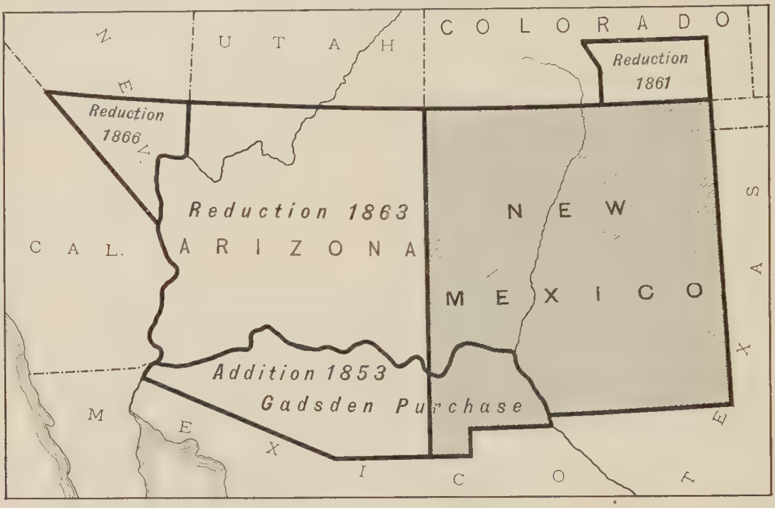
OKLAHOMA.

This Territory was organized in 1889. At that time it comprised only a small area in the heart of Indian Territory. In 1892 it was increased by the addition of the western half of Indian Territory.



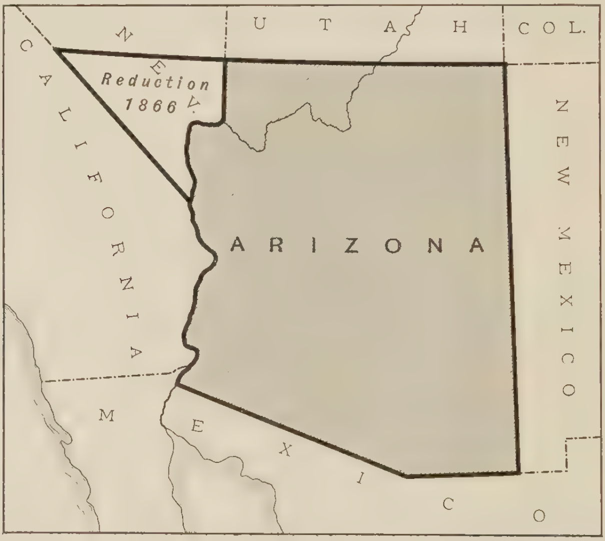
NEW MEXICO.

This Territory was organized in 1850, in part from the First Mexican Cession, in part from the Texas purchase. In 1853 the area of the Gadsden purchase was added to it. In 1861 the portion north of the 37th parallel was added to Colorado, and in 1863 Arizona was cut off, leaving the Territory its present area.



ARIZONA.

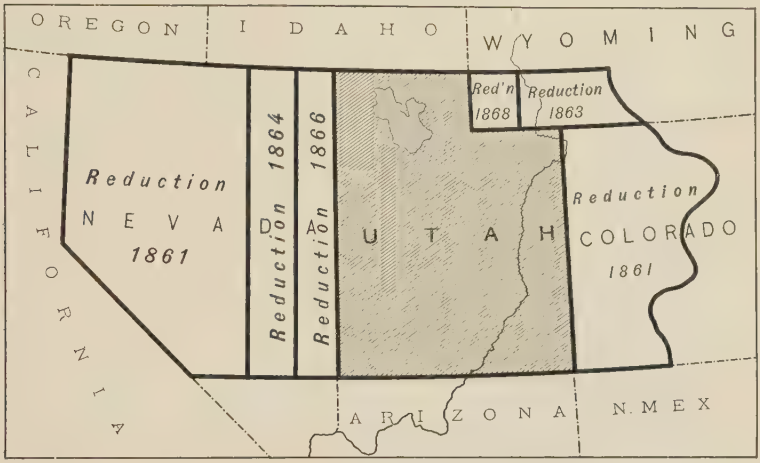
This was organized in 1863, being taken from New Mexico. Originally it comprised, besides its present area, a triangular tract now in Nevada, to which it was added in 1866.



UTAH.

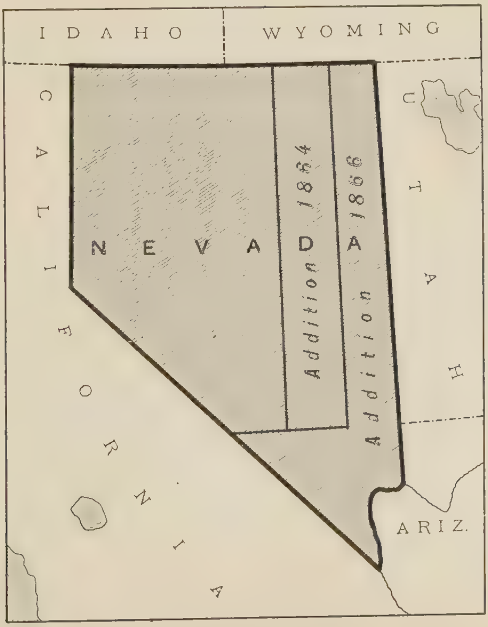
This Territory was formed in 1850 from part of the First Mexican Cession. It originally extended from the summit of the Rocky

Mountains west to the California boundary. In 1861, the formation of Colorado reduced it in the east and that of Nevada on the west. Further reductions were made on the west in 1864 and 1866, both being additions to Nevada, while from the northeast corner a tract was cut in 1863 to add to Idaho, and another in 1868, to increase Wyoming. These reduced the Territory to its present limits. It was admitted in 1896.



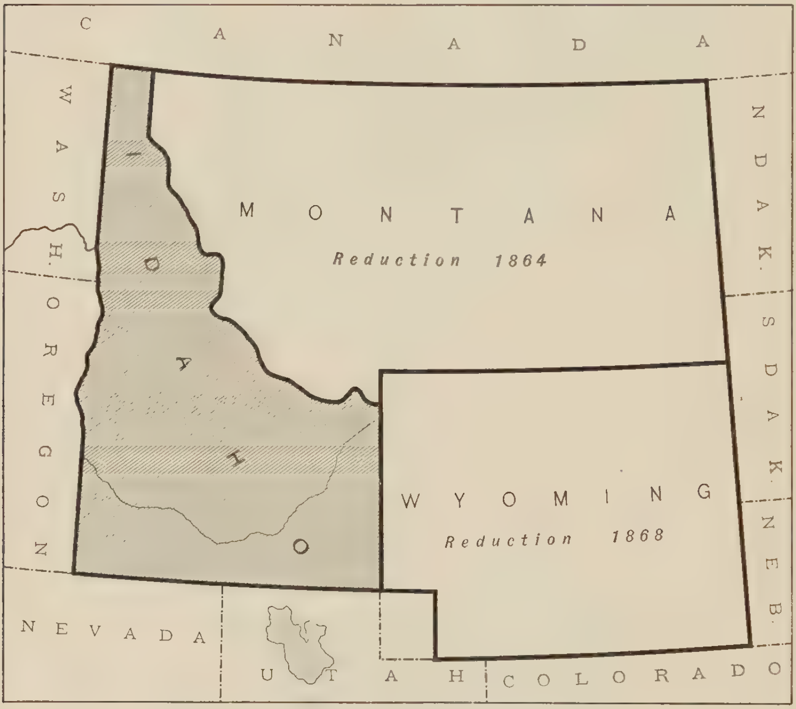
NEVADA.

Nevada Territory was formed in 1861 from the western part of Utah. In 1864 an addition was made to it from Utah, and in 1866 another addition, partly from Utah and partly from Arizona. It was admitted as a State in 1864.



IDAHO.

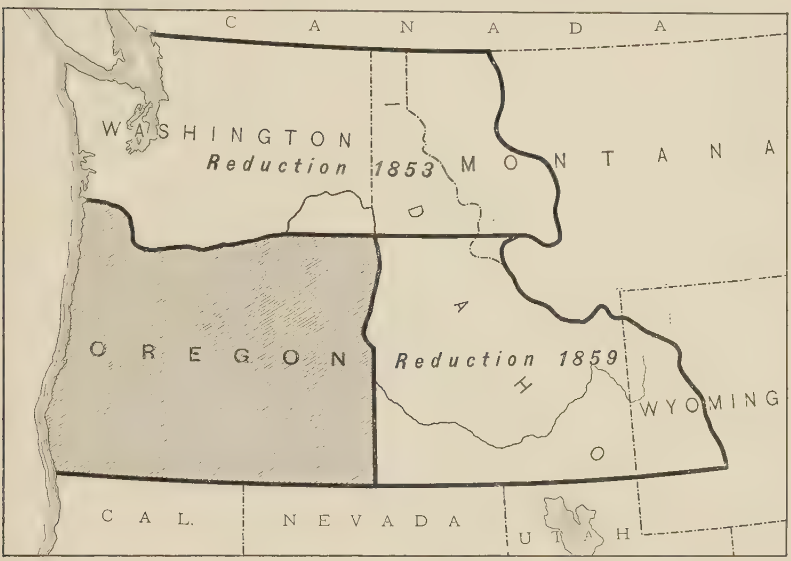
The Territory was formed in 1863 from parts of Washington, Dakota and Nebraska, and included, besides the present area of the State, all of Montana and nearly all of Wyoming. In 1864, Montana was taken from it, and in 1868, Wyoming. It became a State in 1890.



OREGON.

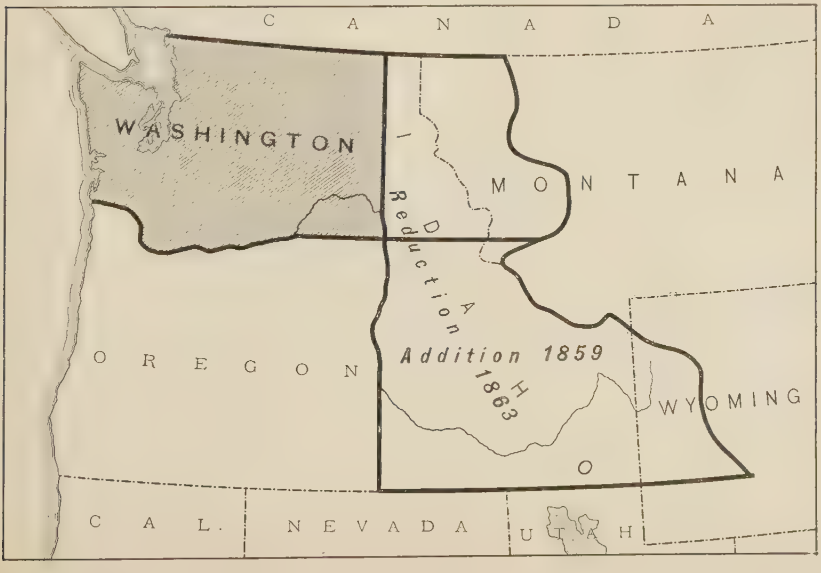
Oregon Territory, organized in 1848, originally included the present States of Oregon, Washington and Idaho, besides the northwestern part of Montana. In 1853, by the formation of Washington Territory, that part of it north of Columbia River and the 46th parallel was taken from it. In 1859, upon the formation of the State of Oregon, it was further reduced by that part lying east

of Snake River and a meridian through the mouth of Owyhee River, which was also added to Washington.



WASHINGTON.

The Territory was formed in 1853 from Oregon Territory and then comprised the region west of the Rocky Mountains, north of Columbia River and the 46th parallel. It was increased in 1859, upon the admission of Oregon, by that part of Oregon Territory which lay east of the present limits of the State. In 1863, Washington was reduced to its present limits by the formation of Idaho Territory. It was admitted as a State in 1889.



Upon the map which constitutes Plate 2, all these changes are assembled. All the above parcels of territory into which the country has been divided by the different State and territorial lines, as they have been shifted from time to time, are here brought together, and the allegiance of each parcel at different times is shown, with dates. The shaded areas are those which have from the first been under the same jurisdiction. Thus the present area of Texas has always been Texas since it was a part of this country. The western portion of New Mexico has always been New Mexico. On the other hand, Kentucky was a part of Virginia up to 1792. Kansas was a part of Missouri Territory from 1812 to 1854. Illinois was part of Northwestern Territory from 1788 to 1800, and of Indiana from 1800 to 1809. A more complicated case is seen in the northeastern part of North Dakota, which has been under many different jurisdictions; Missouri Territory from 1812 to 1834, Michigan from 1834 to 1836, Wisconsin Territory from 1836 to 1838, Iowa Territory from 1838 to 1849, Minnesota Territory from 1849 to 1861, Dakota Territory from 1861 to 1889, when it became a part of the State of North Dakota. These illustrations will enable one to read the map. A study of it will show that a few small areas were apparently for years without jurisdiction. Of these, three small tracts north of the Panhandle of Texas, now in Oklahoma, Kansas and Colorado, are cases in point, and the triangular tract between the Arkansas River and the 38th parallel is another such case.

There are no fewer than 86 parcels of territory represented on this map, besides several which are too small to be shown. Each of these parcels has a different history.

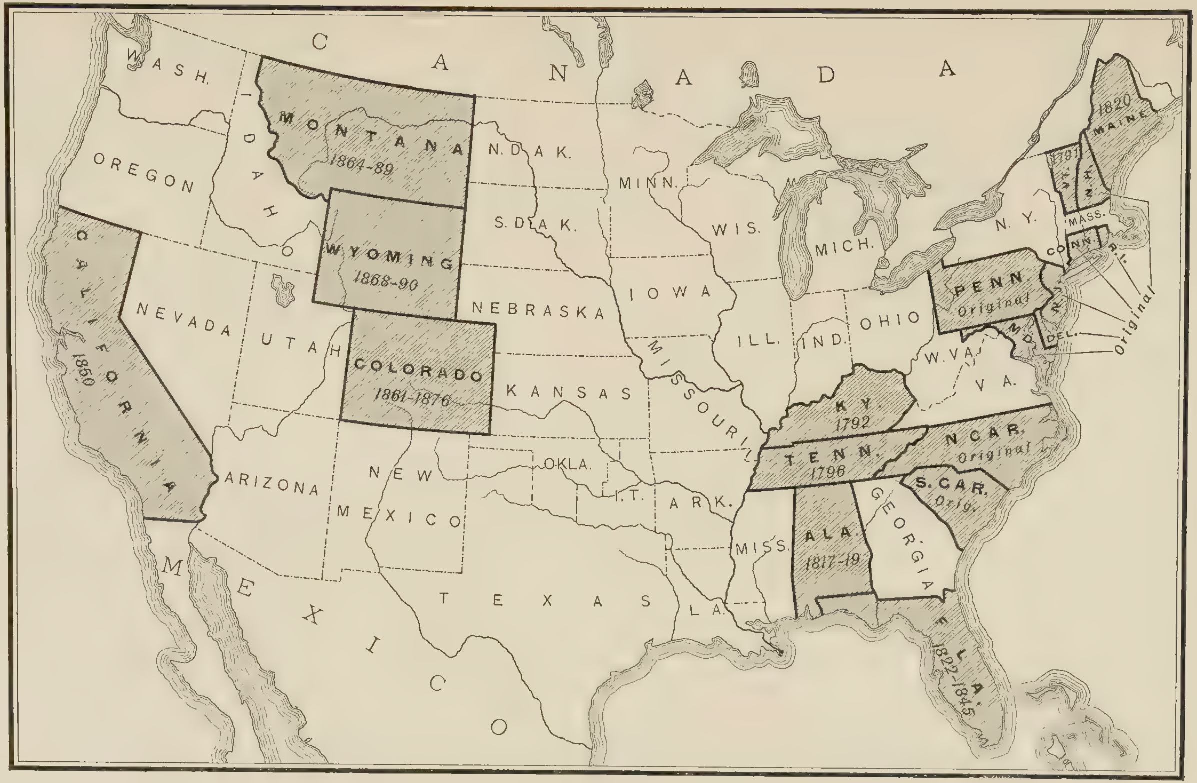


PLATE NO. 3. UNITED STATES, DISTINGUISHING BY SHADING THOSE STATES, WHOSE AREAS HAVE NOT BEEN MATERIALLY CHANGED SINCE THEIR FORMATION.

RECORD OF GEOGRAPHICAL PROGRESS.

THE POLAR REGIONS.

DR. NANSEN'S ARCTIC JOURNEY.—The safe return of Dr. Fridtjof Nansen and his entire party from their three years' voyage in the Arctic Ocean, with a record of many interesting discoveries, is an event of uncommon geographical interest and importance. Here are the chronology and main facts of their wanderings:

Period 1. The *Fram's* Voyage along the Coasts of the Old World (July 21 to Sept. 15, 1893).—Starting from Vardö the *Fram* made all haste through the Strait of Yugor and along the Asian coast, but was prevented by a storm from touching at the mouth of the Olenek River, where an additional supply of dogs had been collected. The course was then laid to the northeast in order to enter the ice-pack west of the New Siberian Islands.

Period 2. The *Fram's* Ice Drift to the Northwest, a year and a half, to Dr. Nansen's Departure on his Sledge Journey (Sept. 15, 1893, to March 14, 1895).—The *Fram* entered the ice on Sept. 22, 1893, in 78° 50′ N. Lat., 133° 37′ E. Long., and its position at the end of this period was 83° 59′ N. Lat., 102° 27′ E. Long. At times the drift was interrupted and occasionally reversed, the ice moving southerly, particularly in the summer months. The drift averaged less than a mile a day. The highest point attained was 84° 04′ N. Lat. As the mean direction of the drift was carrying the *Fram* towards Spitzbergen rather than towards the Pole, Dr. Nansen decided to leave his ship in command of Capt. Sverdrup, and, with Lieut. Johannsen and dog teams, to advance as far north as possible by sledge.

Period 3. Dr. Nansen's Sledge Journey to his Highest North (March 14 to April 7, 1895).—Dr. Nansen left the *Fram* with Lieut. Johannsen, 28 dogs, 3 sledges and 2 kajaks or skin canoes, and in 17 days reached 86° 14′ N. Lat., the highest point he attained. This is 2° 50′, or 170 geographical miles, further north than Lockwood's highest point, reached in May, 1882, in 44° 5′ W. Long. When he stopped he was within 261 statute miles of the North Pole (the distance between New York City and the southern part of the White Mountains). The southern ice drift and rough ice greatly impeded his advance. The longitude of the sledge journey has not been indicated, but it is about 90° E.

Period 4. The Journey Southwest to Franz Josef Land (April 8 to Aug. 26, 1895).—Four months and a half of sledging, rendered very difficult by cracks and soft snow, before Dr. Nansen made his second landing on the coast of Franz Josef Land, at the point where he spent the winter in 81° 13′ N. Lat., 56° E. Long.

Period 5. The Winter in Camp (Aug. 26, 1895, to May 19, 1896).—Dr. Nansen and Lieut. Johannsen built, at a place where sea game was easily procured, a stone-walled hut with roof of walrus hide, the whole covered deep under snow. Here they lived ten months on bear and walrus meat, making new clothing from blankets and sleeping bags from bear skins.

Period 6. The Journey South and the Meeting with the Jackson Polar Expedition (May 19 to July 18, 1896).—Hoping to reach Spitzbergen, Dr. Nansen and his comrade set out to the south and southwest, following open water much of the time till they met, off Cape Flora, the Jackson expedition which had spent two years in Franz Josef Land. The two explorers left Franz Josef Land on the Jackson supply steamer *Windward* on Aug. 7, and arrived at Vardö on Aug. 13, 1896.

Period 7. Continued Drift of the *Fram* from the time that Dr. Nansen left her until she reached the open sea (March 14, 1895, to Aug. 13, 1896).—At first the *Fram*, with Captain Sverdrup and nine men, drifted westward, but, in the summer, adverse winds sent the ice back and it was not till October that the favorable drift recommenced. During the winter and especially in January and the first part of February, 1896, the drift towards Spitzbergen was comparatively rapid. On Oct. 16, 1895, the *Fram* reached the highest latitude she observed (85° 57′ N. Lat., 66° E. Long.) within 17 geographical miles of Nansen's farthest. From this point her drift was mainly southwest towards Spitzbergen. On July 19, 1896, while still 150 miles north of the open sea, Capt. Sverdrup began to force his way through the ice, breaking a channel foot by foot by steam and warping and blasting the ice where it could not otherwise be loosened. On Aug. 13, the day that Dr. Nansen arrived at Vardö, the *Fram* reached open water to the north of Spitzbergen, in 81° 32′ N. Lat., 11° 40′ E. Long. She arrived at Norway on Aug. 20, just a week after the arrival of Nansen.

The scientific results of this remarkable expedition, as far as they have yet been made known, may be thus summarized:

Geography.—Several new islands discovered off the Taimyr peninsulas, and a new island in the north part of the Kara Sea; very shallow water off the mouth of the Olenek River; determination of the non-existence of any large body of land in an area of about 50,000 square miles in the western part of the Asian Arctic ocean, supplementing the similar discovery by De Long relative to the eastern part of this ocean; evidence that Sannikof Land, of which only a small segment of the southeast coast was known, is only a small island and thus defining, within narrow limits and in connection with De Long's work, the extent of the new Siberian Archipelago; evidence, in connection with Jackson's work, that Franz Josef Land contains no extensive land mass, but consists of small icecapped islands, which do not extend much, if any, north of the 82d parallel. This discovery leaves the archipelago or land on the Greenland side, traced along its northwest side by Lockwood and Brainard in 1882, and visited on its southern side by Peary in 1892 and 1895, extending further towards the North Pole than any other land yet discovered.

Geology.—" Found moraines and erratic blocks with striæ under the water. Great disintegration appears to have removed them from above the water. These marks indicate that Siberia has been icecapped, which is opposed to former doctrine."—PROFESSOR MOHN. These discoveries, however, bear out the observations made by Baron Toll, the Russian, along a part of the Siberian Coast in 1893.

Marine Hydrology.—The unusual Arctic Ocean depths previously recorded to the west and southwest of Spitzbergen are found to extend continuously north of that Archipelago, also north of Franz Josef Land, and between that island group and the New Siberian islands to the north of the 79th parallel. South of that parallel, the depth was only up to 90 fathoms. The deepest sounding was 1,942 fathoms (over two miles). Captain Sverdrup writes: " The depth of the sea during our drift was about the same we had found before Nansen's departure, viz., 1,800 to 1,900 fathoms." The most extensive deep known in Arctic waters is thus revealed, and its close proximity to the North Pole largely decreases the probability that there is any very extensive land mass in that neighborhood. "The temperature of the water is from freezing point to −1½ degrees (Celsius) at the surface and to a depth of 100 fathoms. Under this layer the water is above the freezing point to +½ degree to the bottom."—PROFESSOR MOHN.

Professor Mohn in his condensed summary of results, as given to him by Nansen, says: " The current flowed precisely as assumed by Nansen, strongest to the north and northwest in winter and in a contrary direction in summer." This may be assuming too much. Dr. Nansen's theory as to marine currents in the Arctic waters he visited appears not to have been disproved by his experience, but neither has it been substantiated by any facts yet announced. The ice drift was with the prevailing winds. In a letter from Lieut. Johannsen (*London Daily News*, Sept. 8), he says: "One cannot affirm that there is any regular Polar current running below the ice. . . . But it is a fact that the Polar winds have a certain constancy; the ruling direction is northwest, and these Polar trade winds, as they might be called, set in motion the immense ice masses from East Siberia towards Greenland." Captain Sverdrup, in his statement of the *Fram's* drift north of Spitzbergen (*London Daily Chronicle*, Aug. 27), says: "During the summer we had winds from the southwest and west which drifted the *Fram* backwards towards the northeast and east."

The ice was hummocky, alternating with comparatively level floes.

Meteorology.—Daily observations were made with the usual instruments by Lieut. Johannsen, and the temperature and atmospheric pressure were also registered by Richards's apparatus. The lowest temperature was −62° Fahr. and the highest +37½°. After Dr. Nansen started on his sledge journey the temperature was about −40°, with little intermission for three weeks. Blessing made many observations of the aurora, which never appeared to hover low. The simultaneous observations of Nansen, the *Fram*, Jackson and Ekroll will probably prove very valuable. The determinations of relative humidity were successful. The instruments did not rust, a proof of the dryness of the cold air.

Magnetic Observations.—Numerous observations were taken with instruments on Neumayer's system.

Biology.—Organic life was found in the pools on the ice. No animal life was found in the most northern regions, or trace of life in the great oceanic depths. Migratory birds were not seen.

Determining Geographical Coördinates.—The astronomical fixing of localities was made at all seasons with Olsen's universal instrument erected on wooden pillars frozen fast in the ice. The instrument was invaluable in the period of twilight. The chronometers were regularly controlled by observations of the eclipse of Jupiter's moons.

Hygiene.—In sanitary as well as in other respects the *Fram* fulfilled all expectations. The quarters were warm, there was no illness, and plentiful electric light was derived from the windmill and accumulators. Dr. Nansen has new views concerning scurvy.

Methods of Polar Travel.—Dr. Nansen is convinced by his experience in Franz Josef Land that Arctic wintering is facilitated by adopting many of the habits of the Eskimos; also, that "dogs, canoes, sledges, and the greatest possible self-provisioning will allow of journeys towards the Pole being undertaken over the Polar ice."

The *Fram* was exposed to violent ice pressures, but was superior to every strain. Her sloping sides served the purpose intended, and at times she was lifted out of her ice-bed by the intense pressure.

Searching for Dr. Nansen.—While many are rejoicing over the safe return of Dr. Nansen and the *Fram*, the Norwegian trader Hansen, who was sent out on June 1 to look for traces of Dr. Nansen along the northern coast of Siberia, is still in the field. The Russian Geographical Society instructed Mr. Hansen to travel along the coast east of the Yenisei River to ascertain, if possible, where Dr. Nansen pushed into the ice-pack; to visit Cape Chelyuskin, the most northern point of Asia; and to go to the New Siberian islands to learn if the supply depot established there for Dr. Nansen by Baron Toll had been opened.—(*Petermanns Mitteilungen*, 1896, Part VIII.)

THE NEXT ATTEMPT ON THE NORTH POLE.—Mr. Jackson and his party are now spending their third year in Franz Josef Land. The letters that Mr. Jackson sent to England by the *Windward*, in August, indicate that he expected to complete the mapping of Franz Josef Land this fall, and in the spring to push north as far as possible by boat or sledge. "I look upon Queen Victoria Sea," he wrote, "as my most favourable route northward next year. When the sun returns next spring the mapping of Franz Josef Land will be practically complete, and nothing should prevent my attempting the open water or the cryst of ice of this sea." Mr. Harmsworth, who fitted out and is supporting the Jackson Expedition, says that Mr. Jackson will strain every nerve, next spring, to beat Nansen's record. The *Windward* took to him last summer an entirely fresh equipment of sledges, reindeer, portable boats, tents, and food sufficient for several years, and his right-hand man, Lieut. Armitage. Dr. Kettlits and Mr. Hayward remain with him, though they were at liberty, by the terms of their agreement, to return home in August last. By his journeys in 1895–96 Mr. Jackson has shown that the lands seen by Mr. Payer in the Austrian Expedition of 1873–74 were not the coasts of large land masses, as he inferred, but were comparatively small islands. Payer's Zichy Land and Wilczek Land, in fact, do not exist. Mr. Jackson has found that Franz Josef Land consists of small islands; and where Payer placed great land masses on his map Mr. Jackson has found a large sea which he has named Queen Victoria Sea. He has taken over 1,000 photographs, made large collections and some discoveries in natural history, particularly in botany.

MR. ANDREE RETURNS HOME.—Mr. S. A. Andree found the conditions unfavorable for starting on his Arctic balloon journey from Danes Island, Spitzbergen, last summer, and has returned to Norway. He expects to make another attempt next year.

MR. PEARY'S RETURN FROM GREENLAND.—The steamer *Hope* arrived at Sydney, Cape Breton, on Sept. 26, with the personnel and collections of the last Greenland expedition of R. E. Peary, C.E., U.S.N. This is Mr. Peary's fourth visit to Greenland, and the sixth expedition (1891–96) under his direct command or auxiliary to his work, that has gone to Greenland fully equipped for exploratory or scientific research. During the past season Mr. Peary pushed north nearly to Cape Sabine (78° 50′ N. lat.), but was prevented by heavy ice from reaching the cape. Mr. Peary found that last winter was exceptionally severe in Greenland. The east coasts of the American mainland and the islands north of it were blocked by a wide barrier of ice from Turnavik Island, Labrador, to Cape Sabine till late in August. The past summer was marked by much wind and unusually heavy ice, particularly along the west side of Davis Strait and Baffin Bay. On the way north Mr. Peary landed Mr. George Bartlett and his party in the Waigat to collect fossils; Prof. Burton, of Boston, and his party in Umanak Fiord; and Prof. Tarr, of Cornell University, and his party at Wilcox Head, Melville Bay. Before Mr. Peary picked them up on his return these parties were able to devote five or six weeks to geological and glacial studies and natural history collections. Several tons of fossils were gathered. Melville Bay was crossed, in spite of ice and fog, in twenty-six hours, and the *Hope* reached Cape York on Aug. 8, where it was learned that an epidemic of influenza had killed twenty-eight of the Arctic Highlanders, eleven per cent. of their entire number. Anniversary Lodge in Bowdoin Bay, Inglefield Gulf, Mr. Peary's second home in North Greenland, had been burned by the carelessness of a native. The *Hope* touched at various settlements along the coast, making large ethnological collections. Many specimens of walrus, reindeer, narwhal, white whales, seals, etc., and a series of Arctic birds in all stages of growth were obtained. On the return to Cape York an attempt was made to secure the large meteorite east of that point, but the hoisting machinery was disabled in the difficult work, and before the stone could be hoisted aboard the *Hope* was compelled by the ice to retreat on Sept. 3. The stone has been removed to the water's edge, where it may be secured for the American Museum of Natural History at the next favourable opportunity.

Mr. Peary returned with two live polar bears and a hundred cases of collections for the Museum. In a despatch to the New York *Sun*, Mr. Peary expresses the opinion that the work of Nansen and Jackson has eliminated the Siberian Arctic segment and Franz Josef Land as possible polar routes. There remains the Greenland route as the only land base for further attack on the polar problem. Mr. Peary says the land mass north of Greenland, whose south side he saw in 1892 and 1895, and whose north-west coast was traced by Lockwood in 1882, certainly extends to 84° or 85°, and probably beyond, and this most northerly land known would serve as the point of departure. He adds:

> "With an ample supply of provisions a ship might be advanced as far north as Sherard Osborn Fiord. There is as good a chance to force a ship through to that fiord as to Discovery Harbor, where Nares's ship spent the winter of 1875–76. A party composed of two white men and my faithful, hardy, loyal, Eskimo friends from Whale Sound could, by the close of the season in which the ship reached the fiord, have the shores of that archipelago largely determined, and make a supply depot as far north as 85° or 86° from which to start across the ice northward or follow the islands, as the case might be, in the spring. The relief ship need only come to Whale Sound, for the retreat across the ice-cap from the head of Sherard Osborn Fiord with light sledges could be accomplished in two weeks or less."

PEARY LAND.—With the approval and by the desire of geographers in America and Europe, the extreme northern part of Greenland, made known to the world by Mr. Peary's remarkable sledge journey of 1892 on the inland ice, has been named Peary Land. The suggestion was made by the Geographical Club of Philadelphia, and has been seconded by Arctic authorities generally and by *Petermanns Mitteilungen*. His journeys to this region in 1892 and 1896 have hardly been equalled as feats of Arctic sledging. His itineraries covered a distance of about 2,700 miles on the ice-cap at heights of from 3,000 to 8,000 feet above sea level.

NORTH AMERICA.

THE HYDROLOGY OF THE MISSISSIPPI.—James L. Greenleaf, C.E.' in an article on "The Hydrology of the Mississippi" (*American Journal of Science*, July, 1896), says it is fortunate for the dwellers in the Mississippi Valley that the tributary streams differ very widely in their times of flood. If their period of high water occurred simultaneously, the main river would have to carry over 3,000,000 cubic feet of water per second to the Gulf of Mexico. It is rare, however, for more than two large tributaries to reach their highest flood period at the same time. The largest flood from the Ohio, for instance, disappears before that from the Missouri reaches the Mississippi, and through this fortunate circumstance the aggregate in the main river is kept down, so that 1,800,000 cubic feet per second may be regarded as a large flood discharge from the Mississippi. The lower river usually reaches its maximum volume in April or May and its lowest stage in October or November.

BURIED TIMBER IN GLACIAL LAKE BEACHES.—Mr. Ossian Guthrie, who has given much time to researches on the glacial drift of Chicago and the southern shores of Lake Michigan, reports (*The American Geologist*, April and June, 1896) the discovery of three oak logs buried in the beach gravel in that city. One of them, found eleven feet below the surface, was two feet in diameter, and was traced a distance of fifty feet. The second was eight feet below the surface, and fragments of elm, willow, butternut and black walnut were found in the same beach deposit. The third log was found in North Chicago, ten miles from the others, fifteen feet above the present lake, and covered by forty feet of fine clay silt, which protected it so that its wood differs from a modern log chiefly in its blackened color. Its age is estimated at 7,000 years, more or less, equal to the length of the Postglacial or Recent Period.

POPULATION OF MEXICO.—The Annual of the Bureau of Statistics of the Republic of Mexico publishes the results of the last census of the Republic, recently completed. The total population is 12,144,562. The City of Mexico has 326,913 inhabitants; Guadalajara, 95,000; Puebla, 91,275; San Luis Potosi, 63,573; Guanajuato, 52,112; Leon, 47,739; Monterey, 42,529; Pachuca, 39,849; Zacatecas, 38,000. Fourteen other cities have over 20,000 inhabitants each, 38 over 10,000 and 118 over 5,000.

SOUTH AMERICA.

COUNT BAULX IN PATAGONIA.—Count Henry de la Baulx, who has been sent by the French Government to Patagonia and Tierra del Fuego for anthropological and ethnological researches, reached Carmen de Patagones on the Atlantic coast in March last and began his ascent of the Rio Negro. He will follow this river and its tributary, the Limay, to the Cordilleras, will then travel south to the head waters of the Rio Chubut, and will descend it to the sea, at Rawson. He expects to be gone on this journey until May or June of next year, and besides his studies among the natives he hopes to collect much material for the better mapping of the hydrology of southern Patagonia. An excellent outfit of instruments was supplied to him. After his return from this journey he will go to Buenos Ayres to outfit for his work in Tierra del Fuego.

ATTACK UPON DR. HERMANN MEYER IN BRAZIL.—Dr. Hermann Meyer, of Leipzig, who, with Dr. Ranke, of Munich, went to South America to study some of the still unknown tribes of Central Brazil, met with a reverse on the threshold of his work. Before starting for the far interior, however, he went inland from Laguna to the mountain range of the Serra Geral, where he met the almost unknown tribe of the Bugres Indians in the forest of the upper Tubarão River. They gave his party a most inhospitable reception, falling upon his camp one night with a shower of arrows, and compelling him to retreat, fortunately without any loss. The expedition returned to Laguna, and has since pushed into Matto Grosso, where Meyer expected chiefly to work, by way of the Paraná and Paraguay rivers (*Deutsche Rundschau*, 1896, No. 9).

BRAZIL STILL HOLDS TRINIDAD.—As the result of the strenuous protest of Brazil, Great Britain has relinquished her claim upon the small island of Trinidad, which she undertook to appropriate in 1895 as a cable station. Great Britain has acknowledged the sovereignty of Brazil over this island, which is in the Atlantic, a little over 600 geographical miles from the Brazilian coast, below 20 degrees south latitude.

STRUGGLE OF THE ONA INDIANS FOR FOOD.—The commission sent by the Chilian Government to report upon the condition and prospects of its possessions in Tierra del Fuego has reported that the main food resource of the nomadic Onas, who live in the northern half of the main island, is disappearing. In the Chilian territory the Onas subsisted almost wholly upon a small rodent, the cururo, which breeds rapidly, and was found in large numbers on the plains. It does not thrive in wooded regions. These plains have been appropriated by the sheep farmers, and it is a peculiarity of the cururo that it disappears entirely from the districts where sheep are introduced. The result is that the Onas, deprived of their usual means of existence, have been hunting sheep instead of cururos. They like mutton even better than cururo flesh, and have quickly learned to value the sheep pelt; but the farmers and the natives have become enemies in consequence, and the government is engaged upon the problem of adjusting the grievances of both parties.

SHORTENING THE JOURNEY FROM BOGOTÁ TO THE UNITED STATES.—In order to reach Atlantic steamers bound for this country or Europe, the citizens of Bogotá, capital of Colombia, have been accustomed to go by rail southwest to Ibague, then north by the Magdalena River steamers to Santa Maria near the Caribbean Sea, then east by coast steamers to Trinidad. All freight, also, has been forwarded or received by this very circuitous route. The Meta River, east of Bogotá and a tributary of the Orinoco, is nearer the capital than the Magdalena, and a Frenchman, Joseph Bonnet, living in Colombia, has long agitated in favor of utilizing the Meta as a more direct route to Trinidad, making use of the Macareo arm of the Orinoco delta which reaches the sea just south of the island. Mr. Bonnet built a small steamer in Trinidad of about four feet draught which, starting from Port of Spain, ascended the Orinoco and the Meta to Cabuyaro within about 110 miles of Bogotá. The two towns are to be connected by rail with the coöperation of the Colombian Government.—(*Globus*, Vol. LXX, No. 1.)

ASIA.

A RAILROAD FROM MERV TO KUSHK.—The Russian Government has decided to build a railroad from Merv to Kushk, a Russian military post only six miles from the Afghan border at Karatepe and ninety miles north of Herat. The line, passing through the Murghab and Kushk River valleys, will be 225 miles in length and is to be completed in two years. The road will be of military importance and will probably promote trade between Russia and Afghanistan to some extent. According to the understanding between Russia and Great Britain an extension of the line into Afghanistan would be regarded by the latter power as a breach of friendly relations.

A Branch of the Trans-Caspian R.R.—Russia has decided to build a branch of the Trans-Caspian R.R. along the left bank of the Oxus, from Charjui where the railroad crosses the river into Bokhara, to Kerki, about 140 miles.

The Mekong River—Lieutenant Simon, leader of the Hydrographic Commission of the Mekong, who achieved in August, last year, the almost acrobatic feat of forcing the little gun-boat *La Grandière* through sixty-eight rapids in that river between Vien-Tian and Luang-Prabang, is unable to give a very encouraging view of the prospects of utilizing the river for commerce throughout the 1,200 miles between Luang-Prabang and the sea. At low water, navigation is impossible. At medium height, navigation in the cataract regions begins, but is very difficult. At high water (from 25 to 35 feet above mean level), Luang-Prabang may be reached without serious difficulty. About three months in the year the river may be navigated between Vien-Tiang and Luang-Prabang.—(*Revue Française*, May, 1896.)

A Mammoth Skeleton.—The finding of a mammoth skeleton near Tomsk gives additional proof that man was contemporaneous with this animal in northern Europe and Asia. The bones were found at a depth of about eight feet, some of them lying on a fireplace amid prehistoric stone implements. Three bones, believed to be human, were found with the other remains.—(*Globus*, Vol. LXX, No. 3.)

Lakes Explored in Celebes.—The brothers Sarasin have crossed the southeast arm of Celebes and found the two large mountain lakes, Matanna and Towuti, hitherto known only by hearsay. The first is twelve geographical miles long by three wide and a sounding to a depth of 1,575 feet did not reach bottom. The remains of an ancient lake village were found on the south shore and pottery and bronze articles obtained from the natives are similar to relics of the European Lake Dwellers. Lake Matanna is about 1,300 and Towuti 1,150 feet above the level, about 35 miles long and quite wide at its northern end. They occupy an S-shaped valley between mountain ranges.—(*Verhandlungen* of the Berlin Geographical Society, 1896, p. 266.)

AFRICA.

Zones of Altitude in Mid-Africa.—In his recent book "A Naturalist in Mid-Africa," Mr. G. F. Scott-Elliot distinguishes four zones of altitude in Central Africa: (1) the cocoanut or oil palm zone, below 3,000 feet; (2) the coffee zone, from 3,000 to 5,000 feet; (3) the zone adapted for white colonization, 5,000 to 7,000 feet; (4) the cloud belt, about 7,000 feet. He gives the height of Mount Ruwenzori at 16,700 feet. The upper limit of forest on its slopes is 9,000 feet, of bamboos 11,000 feet, and of heather 15,500 feet, at which elevation snow begins.

MARINE TYPES IN LAKE TANGANYIKA.—Mr. R. T. Gunther discusses in the *Quarterly Journal of Microscopical Science* the occurrence of such marine forms as the jelly-fish in the fresh waters of Lake Tanganyika, where also several genera of molluscs are found of an unmistakably marine type. He suggests that these marine forms may have been introduced at a time when the lake region was many hundreds of feet lower than at present and the Atlantic extended over the Congo basin of to-day with a fiord-like arm occupying the present place of Tanganyika. This view that Tanganyika is an old arm of the sea is controverted by the Belgian geologist, M. Jules Cornet (*Le Mouvement Géographique*, 1896, Nos. 25–26), who believes that the present character of the shells is the result of adaptation to environment. So large a lake reproduces, in some respects, the conditions of life prevailing in the ocean as, for instance, in the results of severe storms which would shatter delicate shells. He points out also that the medusæ, a specimen of which from Tanganyika was described by Mr. Gunther, are found in other waters that have had no communication with the sea, as, for instance, at Bámako on the Upper Niger. The fact that no deposits showing traces of marine organism have been found in Central Africa he regards as strong evidence against the theory of the marine origin of the lake. He argues that the formation of the lake was due, more probably, to the earth movements which Prof. Suess shows opened the great East Africa rift of which the bed of Tanganyika forms a part.

THE FRENCH PROTECTORATE OF FUTA-DJALLON.—This large and fertile region of West Africa, within which some of the most important rivers of the Sudan, the Niger, Senegal, Scarcies and Tankisso take their rise, has never been effectively occupied by France, though Dr. Bayol and the Almamy signed the treaty declaring the protectorate in 1881. Since then France's other interests in the Sudan have diverted attention from Futa-Djallon. An administration has now been organized with M. de Beeckmann at its head, supported by Captain Aumar and his tirailleurs. They were received at the capital, Timbo, on March 18 last, by Almamy Bokar-

Biro, who made proclamation of the protectorate and of his fealty to France.

The Sand Dunes of the Sahara.—For several years the French have been experimenting successfully at Aïn-Sefra with a view to fixing the sand dunes on the borders of the Sahara. M. Paul Privat-Deschanel says in the *Revue Scientifique* that a considerable number of plants were found to derive sufficient nourishment from the sand to keep them alive if protected at first so that they might establish themselves before the sand overwhelmed them or left their roots bare. The plan was hit upon of covering large areas with a litter of alfa grass, and in two years 120 acres were reclaimed. The plants that flourish best on the sand thus reclaimed are the Barbary fig, aspen and peach, which thrive better than the tamarisk or acacia, suggested by the Forestry Department.—(*The Geographical Journal*, 1896, September.)

Busumakwe Lake.—Two days' journey southeast of Kumassi, the capital of Ashanti, is Lake Busumakwe, which has long been indicated on the maps under the name Bosonotshe but which was first studied, last spring, by Major Donovan, who spent three days among the very numerous and hospitable people dwelling around its shores. He says the lake is about nine miles long, over six miles wide, and is surrounded by many villages of fishermen. A peculiar feature are the numerous dead tree-trunks standing erect in the lake.—(*Globus*, Vol. LXX, No. 1.)

The Hausa States.—One of the most important African books of this year is "Hausaland," by the Rev. Charles H. Robinson, who has devoted three years to the work of the Hausa Association, and has recently returned from the Hausa territories through which he travelled 1,500 miles. The Hausa Association was organized in Great Britain to study the Hausa language, which is spoken by 15,000,000 people, and the means of introducing Christianity and civilization into these states in the Central Sudan, covering an area of about 500,000 square miles. These states extend from the middle Niger River to Bornu west and east, and from the Sahara to the Benue River north and south. Mr. Robinson entered this region at Loko on the Benue, travelled north to Kano and then southwest to the Niger. Every ten or twelve miles, as a rule, he passed two or more villages of considerable size, and about every fifty miles came to a town containing from 10,000 to 30,000 people. Sokoto, the political capital, is peopled largely by Fulahs instead of Hausas.

Kano is by far the most important town, and its cloth, woven from native-grown cotton, is found all over North Africa from Alexandria to Lagos. More than 25,000 people attend its market daily, and traders from most parts of Africa, north of the Equator and west of the Nile, meet here. The Hausa native is perfectly black, but differs from the ordinary negro, his lips, for instance, being less thick and his hair less kinky. He is industrious, a natural trader, and also a fearless soldier. The governor of the Gold Coast says the only difficulty in battle is to restrain the Hausa soldiers. No part of the Hausa territory is 4,000 feet above the sea, and the region can probably never be colonized by the Caucasian race; but it is now within the British sphere in Africa, and Mr. Robinson says it can be governed and exploited with mutual advantage to Great Britain and the natives. The first great needs are a better monetary currency to supplant cowrie shells, about 100 pounds of which are worth only $2.50; better transport facilities, which a railroad alone can supply; and the suppression of the slave trade and slave raiding, the great evil of the country, one Hausa chief often making war upon another to enslave persons of his own tribe and race.

EDUCATIONAL.

Detailed Topographical Maps in Grammar and High Schools.—Prof. Wm. M. Davis, Professor of Physical Geography in Harvard University, has written two pamphlets on the use of the State maps of Connecticut and Rhode Island, respectively, as an aid to the study of geography in grammar and high schools. The pamphlets have been published by the State Boards of Education of those States. Prof. Davis explains the meaning of the color scheme and contour lines; shows how the use of the map in schools may promote a clear perception of the fundamental facts of earth forces in their relation to Man, their influence upon human conditions and activities; shows how these facts of earth form may be learned by direct observation in the home district, and by the study of pictures, maps and verbal descriptions; gives suggestions for the use of the maps in the study of home geography; defines the geographical features to be observed in field study, such as mountains, uplands, ridges, hills, valleys, lowlands, drumlins, gravel hills, plains, terraces, flood plains, marshes and meadows, tidal marshes, forms of water and coast features; illustrates these forms by examples from these States and elsewhere; indicates the importance of leading the student to perceive the various influences these surface features have had upon settlement, occupations, etc.; suggests a scheme for the distribution of the work through the school course and concludes with remarks on the preparation of the teacher. While these publications are specially designed for use in the schools of Connecticut and Rhode Island, they will be valuable aids in the teaching of geography generally. No teacher in our common schools can give careful study to one of them without having his views enlarged as to the real scope and usefulness to which the teaching of geography may attain in our educational system. If scholars, also, are taught how to handle and understand the excellent maps provided by our Geological Survey, it will go far towards creating a larger demand for a higher grade of cartographic products from map publishers in general.

GEOGRAPHICAL TEACHING IN GREAT BRITAIN.—The Geographical Association in Great Britain has issued a memorandum to the various Boards of School Examiners, with a view to promote a more scientific system of instruction. Examiners are urged to recommend courses of instruction in accordance with the ideas that "the main principles of Physical Geography should form the basis of geographical teaching at all stages," and that in the secondary schools "a general knowledge of geography, based on physical principles, should be required, together with a special study of some selected region, *e. g.*, India, a group of British Colonies, South America, Central Europe."

GEOGRAPHICAL METHODS.—Professor Ludwig Neumann has written a paper (*Geographische Zeitschrift*, 1896, No. 1) in which he surveys German literature on the methods of teaching Geography, presenting a compendium of valuable ideas which the reader could gather from the literature itself only by very large expenditure of time. He insists upon the importance of the teaching of geography by experts, and says it is most absurd to entrust the work of the class-room to a teacher who "has not had a book of geography in his hand for eight or ten years, and has no idea of its scope, methods or teaching material."

GENERAL.

THE CORAL ISLAND EXPEDITION.—The formation of coral atolls and reefs is one of the great disputed problems and the controversy over it has been almost fierce at times, particularly since the accuracy of Mr. Darwin's famous theory has come to be strongly contested. The great difficulty is that while a geologist may wander over a mountain and solve the secret of its existence, he has not been able to study sub-aqueous mountains in any satisfactory way. When Mr. Darwin wrote to Alexander Agassiz on May 5, 1881, concerning the divergent views of coral formation held by himself and Dr. John Murray, he said: "I wish that some doubly rich millionaire would take it into his head to have borings made in some of the Pacific and Indian atolls and bring home cores for slicing from a depth of 500 to 600 feet." The *London Times* says that this is exactly what is now being done, and that an expedition is at work on a coral atoll in the Pacific. The British Association, the Royal Society and the Government of New South Wales are co-operating in the matter. The leader of the expedition is Mr. W. J. Sollas, Professor of Geology and Mineralogy in the University of Dublin. The scene of work is in Funafuti, in the Ellice group, and the largest isle of the atoll of that name. It was selected as a typical atoll. It is about four miles long by a half-mile wide, and is nowhere higher than eight or nine feet. Thither the expedition, with the boring plant from Sydney, was conveyed by the British naval vessel *Penguin*. Prof. Sollas's instructions are simply "to investigate a coral reef by sounding and boring," and he is expected to carry to his work a mind wholly unbiased by the various rival theories of coral reef formation. The chief problem is to ascertain upon what substances coral reefs are formed, and though the coral polyp does not usually live at a greater depth than ninety feet and has never been found at a greater depth than 300 feet, Prof. Sollas will go down 1,000 feet if he can do so with the means at his command, and thus settle the question beyond all doubt. He expects not only to bore through the reef and into its foundations, but also to study the life history of the polyp and its interesting product.

THE BUDDHIST SACRED TREE.—The story of the sacred tree that grows in front of the temple in the Tibetan lamasery of Kumbum has been severely shaken by recent investigations. Father Huc told, in his charming book, of this tree whose leaves were miraculously inscribed with figures of Buddha, sacred formulæ or prayers. Later explorers, among whom were Potanine, Grenard and Szechenyi, saw the tree and attempted to explain the mysterious markings on its leaves and bark. M. Potanine thought some insect wrought the tracings. Another explanation was that the markings pertained naturally to the tree, which was very remarkable indeed, inasmuch as whole sentences in the Tibetan language might be read on the leaves. The one thing certain was that the priests sold the leaves at a very high price to the faithful. M. Edouard Blanc, the explorer, who has returned to France, saw the sacred tree while in

Tibet, and asserts that the holy inscriptions are an evident artifice of human hands, and that the imposition has been handed down from one generation to another of the lamas of Kumbum, who number about 2,000. Some of the leaves were submitted, last summer, to Mr. Thistleton-Dyer, of Kew Gardens, London. He says that the tree is an ordinary *syringa villosa*, common in China, and that the markings are impressed on the leaves by moulds, aided probably with heat.

MISCHIEVOUS EARTHQUAKE PROPHECY.—"Professor" Falb, of Vienna, inflicted grievous injury upon Athens in 1894 by predicting that the city would suffer severely from an earthquake on May 5. Nearly every one who could do so fled from the city, and there was indeed great suffering, caused, however, entirely by Falb, for there was no earthquake. *Globus* (Vol. LXX, No. 1) says that another of his mischievous prophecies threw Valparaiso, Chili, into a sad state of terror in March last. He predicted one of his "critical days" for March 29, and for several days preceding all the trains were crowded with fugitives bound for the mountains. The number of fugitives was about 7,000. There was no earthquake nor trouble of any sort except that caused by this irresponsible prophet.

WASHINGTON LETTER.

WASHINGTON, SEPTEMBER 29, 1896.

It is just fifty years since the Board of Regents of the Smithsonian Institution held its first meeting. To what extent has geographical investigation been stimulated by the Institution in that period? A broad view of the question would include consideration of cognate subjects, such as ethnology, anthropology, archæology, geology, magnetism, meteorology; but for the present purpose the term "geography" will be considered in the usual or popular understanding of the word.

James Smithson, an Englishman who died in 1829, bequeathed a large property (over $700,000) to the United States "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men."

The Institution is not therefore local or even national, but for the benefit of mankind, the United States being merely trustee. The two objects—to increase and diffuse—make no restriction in favor of any country, or kind of knowledge.

The Board of Regents determined that "knowledge can be increased by different methods of facilitating and promoting the discovery of new truths, and can be most efficiently diffused among men by means of the press."

The Act of Congress establishing the Institution required also that there should be a library, a museum, and a gallery of art, with a building on a liberal scale to contain them.

To "increase knowledge," the plan of organization proposed to stimulate men of talent to make original researches, by offering suitable rewards; and to "diffuse knowledge," it proposed to publish a series of reports, and occasionally separate treatises. These purposes have been consistently carried out.

The publications of the Institution consist of

Contributions to Knowledge,
Miscellaneous Collections,
Annual Reports,
Miscellaneous Publications,

the latter consisting for the most part of excerpts from the "Collections" and "Reports."

In the "Plan of Organization" the following objects are named for which appropriations of money or material may be made: Explorations in descriptive natural history, . . . topographical surveys, to collect materials for the formation of a Physical Atlas of the United States, . . . new determination of the weight of the earth, . . . institution of statistical inquiries with references to physical subjects, . . . accurate surveys of places celebrated in American history, . . . explorations and accurate surveys of mounds. And, as a collateral, the formation of a library was contemplated, to consist of a complete collection of the transactions and proceedings of all the learned societies of the world, and of the more important current periodical publications; also, catalogues of memoirs and of books in foreign libraries, so that the Institution would be a centre of bibliographical knowledge on any subject. The opportunity of making its library "a centre of bibliographical knowledge" on any subject was lost, however, when in 1866 it was transferred to the Library of Congress.

The earliest publication of the Institution—"Ancient Monuments of the Mississippi Valley, by E. G. Squier and E. H. Davis"—contains the results of extensive original surveys and explorations, constituting valuable additions to the stock of knowledge on a subject then little understood. The chief features of the work are scientific arrangement, simplicity, directness of statement and legitimate deductions from facts, no attempt at speculation or theory. To this work the subsequent inquiries into the early history of man in the northwest owe their chief impetus. The book is a universal guide and is even now a standard. The numerous cuts illustrating the work having been destroyed by fire in 1865, its republication, repeatedly advised and urged, has never been deemed practicable.

Closely following this first geographical offering, came "Contributions to the physical geography of the United States," by Charles Ellet, Jr., the celebrated engineer of wire bridges over the Niagara and Ohio rivers. The work presents a section from actual surveys, of the descent of the bed of the Ohio River from its source in New York to its mouth on the Mississippi. For this paper there was such urgent demand that it was reprinted and liberally distributed.

In pursuance of a design to construct a Physical Atlas of the United States, the Institution, at an early date (1848), commenced the collection of data concerning the measurements and observations of mountain ranges, canal and railway explorations, etc. But this project seems to have received very cautious encouragement. Prof. George Gibbs, in 1862, strenuously urged the compilation of an Ethnological Atlas; and the same gentleman, a few years later (1865), suggested that the time had arrived when the formation of the Physical Atlas should be commenced on a scale commensurate in magnitude and variety of subject with the scientific progress of America, embracing all the departments of natural, physical and social science capable of being represented in such a form, and extended in its design to the entire continent, since the boundaries of the United States were accidental, and governed by none of the laws which control the operations of nature. He urged that preliminary skeleton maps should be prepared, but not on one scale, for the reason that while one certain part of the continent is comparatively destitute of interest over large tracts of country, others crowd into a small space a great variety, and even confusion, of details. He suggested scales of 1:1,200,000 and 1:600,000 respectively, and, besides these, a map of the entire continent on a large scale, certainly not less than 1:3,000,000, including the Arctic regions and the northern skirt of South America. The published records of the Institution contain no further allusion to the subject.

President Edward Hitchcock, under the auspices of the Institution, was engaged in 1850 in researches on erosions of the surface of the earth, especially by rivers, and also in investigations relative to terraces and ancient sea beaches.

Louis Berlandier, a native of Switzerland—geographer, historian and naturalist—arrived in Mexico in 1826 for the purpose of making researches. He died near Matamoros in 1851. The written results of his labors were deposited in the Smithsonian Institution in 1854, but subsequently withdrawn. The printed catalogue of manuscripts comprises an amount of information of the country west of the Sabine River of great importance. It includes maps of Mexican States projected by Berlandier, maps of journeys, routes, valleys, and topographies of numerous routes; topographical maps of different sections of the country; various routes and maps of ancient Texas, and locations of tribes.

In 1854 the Institution published "Remarks Contributory to the Physical Geography of the North American Continent," by Dr. Julius Frœbel. The author afterwards visited Nicaragua, Santa Fé and Chihuahua as correspondent of the *New York Tribune*, and in 1859 published "Seven Years' Travel in Central America, Northern Mexico and the Far West of the United States."

Dr. J. G. Kohl delivered an address at the Institution in 1856 on The Charts and Maps of America. He explained in a measure the causes of the loss of ancient maps; the use of former maps for completing and testing the accuracy of new ones; the value of maps as historical documents; the use of old maps in respect to boundary questions; and finally, the classes and arrangement of maps. The whole was an argument for a great collection of American maps under the auspices of the Government.

Dr. H. Berendt, a naturalized citizen of the United States, visited Yucatan in 1866, under the patronage of the Institution, in order to obtain a more accurate knowledge of the geography and natural history of that region, and to explore what was still unexplored. He first passed up the Balize River, and thence to the region about Lake Petén, making collections in natural history and prosecuting researches in geography and anthropology. The results of his investigations in part are printed in the Report for 1867.

In 1869 Gen. J. H. Simpson, U. S. A., made an interesting study of the vast geographical field embraced in the march of Vasquez de Coronado, in 1540, in search of the "Seven Cities of Cibola." Gen. Simpson had been officially engaged in the service of the United States in exploring that region. His reconnoissances of a large part of the country traversed by Coronado and his followers gave him an advantage in the discussion of the subject. His report has always been one of the most popular of the many publications of the Institution.

On the invitation of the Superintendent of the Coast Survey, Prof. Alexander Agassiz took passage in the *Hassler* while she was going to her field of duty on the coast of California, *via* the Straits of Magellan, in 1871. At the request of the Board of Regents, Prof. Agassiz gave an account of his expedition at the meeting of January 23, 1873.

In 1877 T. A. McParlin, Surgeon in the U. S. Army, communicated "Notes on New Mexico," but confined chiefly to the climatology of the country. His paper was published in the Report of that year.

In 1878 Dr. L. Kumlein, the naturalist of the Howgate Arctic Expedition, made report of explorations in Greenland. He resided several months at Cumberland Gulf, and sent extensive and valuable ethnological and natural history collections from Arctic America.

In 1890 the Institution published a paper by Col. B. Witskowski and J. Howard Gore entitled History of Geodetic Operations in Russia.

In 1892, W. W. Rockhill made a preliminary report in connection with his expedition to the Chinese Empire, which was partly under the auspices of the Institution. This report was much enlarged and published in 1894 under the title of "Diary of a Journey through Mongolia and Tibet in 1891 and 1892."

In 1894 the Institution published Geographical Tables, prepared by Prof. R. S. Woodward, formerly of the Coast Survey, but now of Columbia College. This work is historically related to Dr. Guyot's Meteorological Tables, first published in 1852, but it is so entirely changed with respect to material, arrangement and presentation, that it is essentially a new publication. It is a representation of the latest knowledge in its field.

Prof. Baird, formerly Assistant and afterwards Secretary, presented for many years, in the Annual Reports (1852–1880), summaries of geographical explorations in all quarters of the globe, under governmental, state, society, or individual auspices. The statements were brief, but carefully prepared. The annual summaries of Prof. Baird were followed from 1882 to 1886 by publications entitled "Progress of Geography," prepared by F. M. Green (1882–3–4), J. King Goodrich (1885), and William Libbey, Jr. (1886).

The Institution has reprinted, from time to time, foreign papers of geographical interest. These comprise:

The Figure of the Earth. By M. Merino. 1863.
Geographical Latitude. By W. B. Scaife. 1889.
The Physical Structure of the Earth. By Henry Hennessy. 1890.
Stanley and the Map of Africa. By J. S. Keltie. 1890.
Objects of Antarctic Exploration. By G. S. Griffiths. 1890.
The Mediterranean, physical and historical. By Sir R. L. Playfair. 1890.
The Present Standpoint of Geography. By C. R. Markham, F.R.S. 1893.
The Renewal of Antarctic Exploration. By John Murray. 1893.
The North Polar Basin. By H. Seebohm, F.R.S. 1893.
How Maps Are Made. By W. B. Blaikie. 1893.
Variation of Latitude. By J. K. Rees. 1894.
Antarctica: a Vanished Austral Land. By H. O. Forbes. 1894.
Promotion of Further Discovery in the Arctic and Antarctic Regions. By C. R. Markham, F.R.S. 1894.
Physical Condition of the Ocean. By W. J. L. Wharton, R.N. 1894.

The Development of the Cartography of America up to the year 1570. By Dr. S. Ruge. 1894.

Race and Civilization. By W. M. F. Petrie. 1895.

Oceanography, Bionomics and Agriculture. By W. A. Herdman. 1895.

Compulsory Migration in the Pacific Ocean. By Otto Sittig. 1895.

Old Indian Settlements and Architectural Structures in North Central America. By Carl Sapper. 1895.

The Cliff Villages of the Red Rock Country, Arizona., etc. By J. W. Fewkes. 1895.

The Institution has recently issued a new catalogue of its publications, prepared by William J. Rhees, so long connected with this branch of the service.

GLACIAL LAKE AGASSIZ.—The explorations of Mr. Warren Upham while engaged in the geological and natural history survey of Minnesota (1879–85) showed that a very large lake occupied the Red River Valley in the closing stage of the glacial period.

The highest shore-line of the lake in Minnesota was mapped through its prairie portion, extending about 175 miles from Lake Traverse eastward to Herman, and thence northward to Maple Lake.

As a satisfactory investigation of the extent and history of the extinct lake would comprise both sides of the Red River Valley, the United States Geological Survey undertook the more extended examination of the area, and assigned Mr. Upham to the duty. When the shore-lines had been mapped through North Dakota to the Canadian boundary line, it was arranged with the authorities of the latter country that Mr. Upham's work should be continued through Southwestern Manitoba. Altogether the explorations occupied six years, and the results are embodied in a volume recently published by the United States Geological Survey,* entitled "The Glacial Lake Agassiz."

The situation of this great lake was in the geographic centre of the continent,—about one-fifth lying within the United States. The area covered was approximately from 45° 30′ to 55° north latitude, and from 92° 30′ on the boundary to 106° west longitude. It was several times larger than Lake Superior; in fact, it exceeded the aggregate area of the five great lakes contributory to the St. Lawrence. Through the earlier part of its duration it outflowed southward to the Mississippi River. Later it outflowed by lower avenues northeastward. Finally it was reduced to Lakes Winnipeg, Manitoba and Winnipegosis, which are its lineal descendants. It covered at one time portions of Manitoba, Minnesota and North Dakota.

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* Monograph, Vol. XXV.

In explanation of the existence of this lake and of its name, Mr. Upham says: "When the Glacial period in North America was ending, as soon as the border of the ice had receded beyond the watershed dividing the basins of the Minnesota and Red rivers, it is evident that a lake, fed by the glacial melting, stood at the foot of the ice-fields, and extended northward as they withdrew along the Red River Valley to Lake Winnipeg, filling this valley to the height of the lowest point over which an outlet could be found. Until the ice barrier was so far melted upon the area between Lake Winnipeg and Hudson Bay that this glacial lake began to be discharged northeastward, its outlet was along the present course of the Minnesota River. Because of its relation to the retreating continental ice-sheet, the lake has been named in memory of Prof. Louis Agassiz, the first prominent advocate of the theory that the drift was produced by land ice."

EXPEDITION TO THE SOUTHERN HEMISPHERE.—We have a reminder of the U. S. Naval Expedition to the Southern Hemisphere in 1849–52, under Capt. J. M. Gilliss, by the recent appearance of "A Catalogue of 16,748 southern stars deduced by the U. S. Naval Observatory from the zone observations made by the U. S. Naval Expedition during 1849–52."

The Narrative of this expedition, excepting Vols. 4 and 5, was published in 1855–56. The material comprised in the "Catalogue" now issued was originally intended to form Vols. 4 and 5, but owing to the insufficient staff of workers and the death of Capt. Gilliss the work was never completed. At the time of his death much had been done, and before the office of the Expedition was closed in 1866, the manuscript of the Observations to be contained in Vol. 4 was ready for the printer, and Vol. 5 was so far advanced that it was supposed it could be finished in about a year. From 1866 to 1894 the papers were in the custody of the Naval Observatory, receiving such attention in the way of computations and reductions as the time at the command of the force would allow. The reductions were finally completed by Professors E. Frisby, U. S. N., and S. J. Brown, U. S. N., and have just been issued as "Appendix i, Washington Observations for 1890." This volume of 486 pages 4to, may therefore be considered the substitute for the 4th and 5th volumes of Gilliss's U. S. Naval Astronomical Expedition.

OCEANIC ICHTHYOLOGY.—The great work by the late Dr. G. Brown Goode and Tarleton H. Bean on the deep-sea and pelagic fishes of the world has been published under the supervision of the Smithsonian Institution. Oceanic ichthyology is concerned with the study of fishes which dwell in the open ocean far from the shore.

The authors do not claim that they have brought forward any conclusions which are new to science, though a great number of new facts are recorded. The information which they have obtained they have endeavored to bring into proper relationship with the mass of similar knowledge already recorded. The work as it now appears was first ready for the press in 1885, then revised and re-written in 1888, then again in 1891, and again in 1894, as it was going through the press. The authors say: "In its present form it stands as a compendium and summary of existing knowledge in regard to Oceanic Ichthyology. No one knows when there will be opportunity for its further study. There are no expeditions and there seems to be no prospect for new ones. Even the *Albatross*, built by the United States expressly for this service, is diverted to police duty about the Seal Islands."

ALASKA BOUNDARY.—The Superintendent of the Coast Survey says that in determining the 141st meridian of longitude the notes of the British surveyor have been compared with those of the American surveyors and have been found to vary so little that no trouble will be found in striking a compromise between the two lines. The maps of the whole survey, that is to say, of the 141st meridian, and of the line of ten marine leagues from the coast, are now in possession of the two Governments, and it is understood that negotiations are about completed looking to the selection of a joint commission to strike the line between the two countries. The Superintendent expresses the belief that the Alaskan gold fields are located on the American side of the 141st meridian.

NICARAGUA.—Mr. Henry E. Low, the Vice-Consul at Managua, has sent to the Department of State a map of Nicaragua, which gives a rough sketch of the existing railroads in the country and the lines which are projected. The thickest parts of Nicaragua lie on the Pacific, and civilization does not reach, on an average, much further inland than about 100 miles from the coast. Beyond this 100-mile belt, the country is not even properly explored.

NOTES.—The U. S. Hydrographic Office has recently issued a new chart—34 x 41 inches—of the Pacific Ocean, compiled from the latest information; also, of the Atlantic Coast from the Strait of Belle Isle to New York; and of portions of the west coast of North America, that is to say, of the west coast of Lower California, and the west coast of Vancouver Island. The office has also published Sunrise and Sunset Tables, showing the local mean time of the sun's visible rising and setting for each degree of latitude between 60° N. and 60° S., and for each degree of the sun's declination.

Mr. W. J. Hoffman, of the National Museum, has in press an illustrated work on the Graphic Arts of the Eskimos, in which he discusses their geographical distribution, population, early explorations, pre-historic art, art in general, ornamentation and materials employed, pastimes, gesture signs, etc.

The United States Geological Survey is placing iron monuments in Wyoming at each township corner, with bench marks. The posts are iron tubing, 3½ inches in diameter and 4 ft. long. On the top is fastened a brass plate on which is stamped "U. S. Geological Survey, B. M." The elevation, township and range numbers will be stamped on the plate by dies carried by the engineers. In the future, all Government surveys will be marked in this manner in the West. The system will be of immense value to settlers, ranchmen and civil engineers. H.

BOOK NOTICES.

Report of the Sixth International Geographical Congress, held in London, 1895. With Maps and Illustrations. Edited by the Secretaries. 1896. London: John Murray, Albemarle Street, Berlin: Dietrich Reimer (Hoefer & Vohsen). Paris: Hachette et Cie.

While the two Secretaries hold themselves responsible for this Report, they say in their preface that the editorial work has been done by Dr. Mill. They rightly call attention to the fact that the International Geographical Congress is now a permanent institution, in virtue of the First Resolution adopted:

> That the officers of each Congress continue to act until the organization of the following Congress, in order—
>
> (1) To carry out as far as possible the resolutions of the last Congress;
>
> (2) To keep up relations with the special committees which may be appointed;
>
> (3) To communicate with the Organizing Committee of the following Congress regarding all questions pending;
>
> (4) To present to the following Congress a report on the work done in the interval.

An apology is made for delay in the publication of the volume, which seems, however, to have been produced with all reasonable speed, since it was delivered in New York, well printed and handsomely bound, in less than a year from the opening of the Congress.

The Introductory gives a brief account of previous Congresses, and a diary of the proceedings of the Sixth in London. The papers, printed in English, French, German, or Italian, as originally read, fill 800 pages, and there are two appendices; one of 84 pages, containing the List of Members, the other giving the Catalogue of the Exhibition, in 200 pages.

Some of the more elaborate papers are: Geography in the Schools and in the University, by M. Emile Levasseur; The Training of Instructors in Geography in the University, by Dr. R. Lehmann; On the Importance of Geography in Secondary Education, and the Training of Teachers therein, by Andrew J. Herbertson; On South Polar Exploration, by Dr. G. Neumayer; Arctic Exploration, by Rear-Adm. A. H. Markham, R. N.; Russian Explorations of the Maritime Route to Siberia, by Lieut.-Col. Julius de Shokalsky; The Geodetic Operations of the Indian Survey, by Gen. J

T. Walker, late Surveyor-Gen. of India; The General Levelling of France, by M. Charles Lallemand; A Brief History of the Surveys and of the Cartography of the Colony of the Cape of Good Hope, by A. de Smidt, late Surveyor-Gen. of the Colony; On the Geodetic Survey of South Africa, by Dr. David Gill, H. M. Astronomer at the Cape of Good Hope; A Retrospect of Oceanography during the last twenty years, by J. Y. Buchanan, F.R.S.; On Some Points Connected with the Orthography of Place-Names, by G. G. Chisholm, M.A.; Geographical Place-Names in Europe and the East, by Dr. James Burgess, C. I. E. (this paper gives the principal Indian, the Arabic, Turkish, Persian, Hindustani and Russian alphabets); On the State of Geographical Exploration in the Western Half of New Guinea, by Dr. C. M. Kan; On the Morphology of the Earth's Surface (with a proposed terminology), by Dr. Albrecht Penck.

M. Gobat presented the Report of the Committee appointed by the Fifth International Congress (Berne, 1891) to take measures for giving effect to the resolutions adopted. Of these the more important were: On the Plan of a Map of the World on the scale of 1:1,000,000; on the Choice of an Initial Meridian; on the recommended adoption of the metric system in English scientific and technical publications; on the Orthography of Geographical Names; and On the Creation of Geographical Bibliographies.

Nothing has been done with regard to the choice of a meridian or the adoption of the metric system. In bibliography, Germany, Austria, Hungary and Switzerland have published in whole or in part their contributions, and The Netherlands had anticipated the resolution of the Congress by the publication in 1888 and 1889 of a complete bibliography in three volumes.

Dr. Penck's project for a map of the world on the scale of 1:1000,000 has not made much progress, but it has attracted a great deal of attention and criticism, and Gen. de Tillo's remarks, printed in the *Discussion* (pp. 382–386), are full of instruction.

The matter of geographical orthography remains where it was. Mr. G. G. Chisholm, in his lucid paper, sketches a plan of operations for the introduction of a consistent scheme. He would have this adopted by Government and other official boards, by leading publishers and by all authors, by missionary societies, Chambers of Commerce, steamship companies, foreign railway companies, etc., and by the daily press. A more ample programme has not been printed since the day of Volapük

Memoirs of the Peabody Museum of American Archæology and Ethnology, Harvard University. Vol. I.—No. 1, Prehistoric Ruins of Copan, Honduras. A Preliminary Report of the Explorations by the Museum, 1891–1895. 4to. Cambridge, Mass: Published by the Museum, 1896.

The ruins of Copan are in the territory of Honduras, about twelve miles from the frontier of Guatemala, in the valley of the Copan River, and shut in by mountains that rise to a height of 3,000 feet. The valley is at an elevation of 2,000 feet above the sea.

When Stephens visited the ruins in 1839, they were buried in a great forest. To-day the valley is cleared. About thirty years ago, a colony from Guatemala cut down the trees, leaving only a few gigantic cedars and ceibas about the ruins of the temples.

The valley is a mile and a half in width and seven or eight miles in length, and the river Copan winds through it in a south-westerly direction. The principal ruins are on the right bank of the river, near the centre of the valley, and the stream, bending abruptly at this point, flows directly against them. For a long time, according to the *Report*,

> it has been making encroachments on the ruins, and the entire eastern side of the great pile known as the Main Structure has been carried away by it, leaving the interior exposed in the form of a cliff one hundred and twenty feet high. The whole of this elevation is artificial; pieces of pottery and obsidian knives can be picked out of it even at the water's edge. The river is subject to annual freshets, during which an immense body of water is thrown with great force directly against the opposing cliff, from whose face a fresh portion falls in each succeeding year. So swift is the current that little of this fallen material is left when the water subsides.

It was time that something should be done.

In 1885 Mr. A. P. Maudslay, an Englishman, mapped the ruins and made careful explorations. He took moulds of the principal monuments and has published the result of his studies in a form which makes it, in the words of the *Report*, at this date the most valuable contribution to the archæology of Central America.

In 1889 Mr. E. W. Perry obtained a concession from the Government of Honduras, for the exploration of the ruins and the formation of a museum at Copan. Mr. Perry in 1891 transferred his rights under the concession to the Peabody Museum, which drew up a plan of operations, and acquired, by an edict of the Honduras Government, the care of the antiquities of the country for a period of ten years, with the right of exploring the ruins and taking away one-half of the objects found in the excavations.

In the period 1891–1895 four expeditions were sent out, the third under Mr. Maudslay, who has done all in his power to further the work of the Museum.

The Report is illustrated by nine plates, the first being a large plan of the ruins, with descriptive text.

The Relations of the Gulf Stream and the Labrador Current. By William Libbey, Jr., D. Sc., Professor of Physical Geography, Princeton, N. J. (*With Plates.*) *Reprinted from the Report of the Sixth International Geographical Congress, held in London, 1895.*

The investigation of the relations of the Gulf Stream and the Labrador Current was begun by the U. S. Fish Commission in 1889, with the view of ascertaining whether the changes in the positions of these currents affected the movements of the schools of fish along our eastern coast. The plan adopted by Prof. Libbey was to run out a series of lines at intervals of ten minutes of longitude, extending to the southward from the New England coast, between the island of Nantucket on the east, and Block Island on the west. Upon these lines, at intervals of ten minutes of latitude, stations were located, upon which serial temperature and density observations were made, and simultaneously with these an hourly set of complete meteorological records was maintained.

A study of the temperature profiles obtained in 1891 showed that the lower part of the 50° line (representing the lower portion of the Gulf Stream) touched the edge of the continental platform and raised its temperature ten degrees. This had occurred also in 1890. If it continued in 1892 the conditions for the reappearance of the tile-fish (*lopholatilus chamæleonticeps*) would be reëstablished. In 1880 and 1881 this fish appeared on the New England coast in considerable numbers; but in the spring of 1882 the water from Cape May to Nantucket was covered with millions of dead and dying tile-fish, and from that time they disappeared.

The fish is probably a deep-sea tropical species and it is supposed to have followed the northward extension of a band of warm water. In 1892 Prof. Libbey found the tile-fish to the southward of Martha's Vineyard and all the way to the Delaware capes, and he explains its disappearance in 1882 by the withdrawal of the band of warm water under the pressure of a cold current. He notes the interesting fact that the dead bodies of the fish came to the surface in that year in a long crescent-like curve, which followed the line of the edge of the continental platform between Cape May and Nantucket.

The paper is illustrated by 21 coloured profiles of the water temperatures.

The Discovery of America by John Cabot in 1497. Being Extracts from the Proceedings of the Royal Society of Canada, relative to a Cabot celebration in 1897, and the Voyages of the Cabots, a paper from the Transactions of the Society in 1896, with Appendices on Kindred Subjects, by Samuel Edward Dawson, Lit. D. (Laval). Ottawa, 1896. For sale by James Hope and Sons.

At the meeting of the Royal Society of Canada, held at Ottawa in May, 1896, it was decided to make arrangements for a meeting at Halifax in 1897, in order to commemorate the discovery of the mainland of America by John Cabot in 1497. A committee was also appointed to obtain designs for a monument, to cost not less than $1,000, to be erected at Sydney, Cape Breton Island, in honour of the discoverer.

The Society does not commit itself to a theory of Cabot's landfall, but selects Sydney as on the whole the best site for the proposed monument.

Dr. Dawson's paper on the Voyages of the Cabots is a sequel to his paper on the same subject in the *Transactions* of the Royal Society for 1894. In that he argued in favour of Cape Breton as the landfall of Cabot, and he now considers the objections which have been made to his theory, by Mr. Justice Prowse, the historian of Newfoundland, and by Mr. Henry Harrisse.

Judge Prowse believes that the landfall was Cape Bonavista in Newfoundland, and he gives, as quoted by Dr. Dawson, the following reasons: the unbroken tradition in Newfoundland, and the inscription, *A Cabote primum reperta*, opposite to Cape Bonavista in John Mason's map of Newfoundland, about 1616.

Dr. Dawson rightly remarks that a tradition presupposes settlers to hand it down, and that there were no settlers for a hundred years after Cabot.

The legend on Mason's map is not much stronger than the unbroken tradition. No such legend is found in any one of the maps published in the 119 years between the date of the discovery and that of Mason's map.

Mr. Harrisse, in his work on the Cabots, published this year in London, makes the landfall at or near Cape Chidley, in Labrador. He objects to the Cape Breton landfall that in June and July navigation all round Newfoundland and the Gulf of St. Lawrence is impeded by fogs, icebergs and undercurrents, and that, therefore, Cabot could not have reached Cape Breton at the time stated.

Dr. Dawson attributes this astonishing error, as he calls it, to Mr. Harrisse's lack of personal knowledge of the north-eastern coast of America. The fact is that in the summer a procession of icebergs and field-ice, 1,000 miles long, comes down the Labrador coast, where Mr. Harrisse now places the landfall of Cabot. In 1886, an uncommonly early season, the captain of the *Alert* found far to the south of Cape Chidley, on the 2d of July, heavy field-ice packed tight for 15 miles off shore, with a *bordage* of slack ice, ten miles further out. The land reached by Cabot on the 24th of June is described by him as excellent and the climate temperate, suggesting that brazil-wood and silk grow there.

Mr. Harrisse supposes that Cabot, in following the coast, cast anchor at sundown and sailed again with daylight the next morning; a supposition which Dr. Dawson, who knows the Labrador coast, finds it impossible to admit.

Fish were abundant on the coast discovered by Cabot. The vicinity of Cape Chidley is noted for its amazing quantity of codfish, and this seems to Mr. Harrisse to strengthen the argument in favour of the Labrador landfall.

In answer to this it is shown from Prof. Hind's statement laid before the Fishery Commission at Halifax, that the codfish do not arrive at Cape Chidley until the 15th of August, while it is known that on the 10th of August, 1497, John Cabot was in London, with the news of his discovery.

Dr. Dawson closes his temperate paper with these words:

> it is not likely that there will be absolute uniformity of opinion upon this point, any more than there is upon the identity of the island, Guanahani, which was the landfall of the great admiral.

Wherever Cabot first came to land, he virtually discovered North America. Admitting this as an established fact, Dr. Dawson's readers must think it strange that he maintains throughout this later paper the erroneous claim made for Cabot in the paper of 1894, in these words:

> Upon that easternmost point (Cape Breton) of this Nova Scotian land of our common country John Cabot planted the banner of St. George on June 24, 1497, more than one year before Columbus set foot upon the main Continent of America . . . . what shall Canadians do to commemorate the fourth centenary of that auspicious day when the red cross was planted on the mainland across the western sea . . . . . ?

Enthusiasm in a good cause is commendable, and Cabot's discovery was an achievement worthy of celebration; but if his landfall was Cape Breton, the red cross was planted, not on the mainland, but on an island. Mr. Harrisse may very well remark, in his turn, that Dr. Dawson does not seem to know the Canadian coast.

Crónica del Undécimo Congreso Internacional de Americanistas, primero reunido en México en Octubre de 1895, escrita por Enrique de Olavarria y Ferrari, México, 1896. Imprenta y Litografía "La Europea" de Camacho, Calle de Santa Isabel núm. 9.

This *Crónica* contains reports of the daily sessions of the Congress of Americanists, with full notices of the receptions, banquets and excursions, offered by the Mexican Government and the citizens of the capital to their guests. Señor Olavarria's style is diffuse and flowing, and he leaves nothing to the imagination of his readers, whether he describes the Valley of Mexico or sets before them the character and career of President Diaz. An interesting chapter is the ninth, on the Excursion to Popotla and the tree of the *Noche Triste.* This gives the detailed story of the fire which broke out in the great tree May 2, 1872, and burned for sixteen hours before it could be extinguished; but the tree was not killed, and now, after twenty-four years, its trunk and single remaining arm are perennially green and full of vigour. It is now protected by an iron grating.

The papers submitted to the Congress are yet to be published.

The Twelfth Congress is to meet at the Hague.

The sixth volume of the Publications of the University of Pennsylvania, Series in Philology, Literature and Art, is now in preparation. This volume contains:

a. The Antiquity of Man in the Delaware Valley.
b. Exploration of an Indian Ossuary on the Choptank River, Dorchester Co., Md. (With a description of the Crania discovered by E. D. Cope; and an examination of traces of disease in the bones, by Dr. R. H. Harte.)
c. Exploration of Aboriginal Shell Heaps on York River, Maine. By Henry C. Mercer, Curator of the Museum of American Archæology.

These publications are issued through Messrs. Ginn & Co., 9–13 Tremont Place, Boston, Mass., in volumes of 200 or 250 pages, comprising two or more monographs, at $2 per vol. to subscribers. Each monograph may be obtained separately.

A Naturalist in Mid-Africa, being an Account of a Journey to the Mountains of the Moon and Tanganyika. By G. F. Scott Elliot, M.A., F.L.S., F.R.G.S. London, A. D. Innes & Co., Bedford Street, 1896.

In his preface Mr. Scott Elliot expresses his thanks to the many who have aided him in the preparation of this work by giving shape and form to his MSS. as well as to his illustrations, originally very bad, and by contributions to the scientific matter. His map, now produced for the first time, corrects some of the inaccuracies retained "in deference to a more recognized authority" in the one constructed from his materials and published in the *Geographical Journal*, Vol. 6, p. 400.

This more recognized authority was Mr. H. M. Stanley, whose necessarily imperfect sketch of the Ruwenzori region was not to be doubted. Mr. Scott Elliot notes some of Stanley's errors:

> Mount Gordon Bennett, Mackinnon Peak, and Mount Lamson are not mountains, but quite insignificant hills, if they have any existence at all (*p. 194*).
>
> Stanley's Observation Hill was not noticeable in any way, but it should be on the right-hand bank (*p. 255*).
>
> I spent much time and trouble in trying to discover where on earth the enormous fresh-water sea, discovered and christened the Alexandra Nyanza by Mr. Stanley, could possibly be. This, of course, it is now clear, has no existence whatever; apparently the name is applied to a papyrus fringe on the course of the Kagera proper (*p. 256*).

So much for self-vindication. The author's route was from Mombasa to the northwest, then along the upper shore of the Victoria Nyanza to the country between that and the Albert Edward, thence to the Tanganyika and Lake Nyassa and through Blantyre to Chindi, where he took passage for Zanzibar.

The first stage was across a thorn desert to Nzowi in the well-cultivated Wakamba country, where the climatic conditions begin to be suitable to Europeans, and so continue through the Masai highlands. At Nandi begins the descent to the Victoria Nyanza region, a plateau stretching westward to the base of Ruwenzori and at an elevation of about 4,000 feet.

From the observations Mr. Scott Elliot comes to the conclusion that the Victoria lake must at one time have been a hundred feet above its present level. Then, perhaps by the cutting away of the rock at the Ripon Falls, the lake began to sink, and is still falling. The valleys, even at 200 miles from the Victoria, are filled with the rich alluvium that is common in Lower Egypt. This deposit is often 30 feet deep and would produce, with irrigation, enormous crops of cotton, sugar, rice and wheat. So far as has been ascertained, however, the natural productions of Uganda are not of great value, and the Victoria region is poor in dyes and gums, medicines and fibre plants. Iron is the only known mineral.

The climate of Uganda is not unhealthy and the annual rainfall, from eight years' observations at the Missionary Station of Natete, is 47.61 inches.

On the way to the Ruwenzori Mr. Scott Elliot was taken with fever, and made all haste to ascend the mountain. At the height of

7,000 feet he found a temperature not very different from that of England, and English plants, such as the sanicle, the meadow rue, the forget-me-not and St. Johns wort, flowering in the same month as their cousins in Dumfriesshire. He devotes a chapter to the consideration of some of the problems suggested by the presence of these plants on a ridge of Ruwenzori. At 7,000 feet the forest begins; from 9,000 to 11,000 is the bamboo zone, and above that the heather, in a ground of peat moss covered with sphagnums to a depth of 18 inches. Here the heather develops into trees, nearly two feet in diameter and 80 feet high. The snowline of the mountain is at 15,500 feet.

Geologically, Ruwenzori is supposed to have formed a part of the original Victoria region plateau of underlying gneissose rocks, covered by mica schists, with intrusive dykes of lava. Then an elliptic area, now the central cone of the mountain, was elevated. Mr. Scott Elliot thinks he has seen evidence of glaciation in the typical V-shaped valleys.

The Germans find little favour with Mr. Scott Elliot. He accuses them (p. 26) of shooting the Masai on sight, and making the name of the white man odious (p. 158). He himself entered German territory, giving full information of his movements and doing everything in his power to pay for everything. The result was, in his own words, that

> the German Government stole my guns (p. 158).

This looks like small business for a great Government; but there is room for doubt, and the following broad statement, on the same page, seems to show that Mr. Scott Elliot is not always in a judicial frame of mind:

> In fact, the courteous manner in which the English Government treats others, and the extreme want of courtesy with which Englishmen are treated by the German and French Governments, is almost beyond belief.

None the less, the Germans, as well as the Belgians, are commended for resolute dealing with the Arabs, whose rule, it is declared, involves the moral, mental and physical ruin of every subject native race.

Mr. Scott Elliot devotes a chapter to the Suahili, the half Mohammedan porters and carriers of East Africa.

They are, he says, pure savages, not to be managed without the whip, children in their want of forethought and in cheerfulness. They are wanting in affection, even for each other, though at times they display attachment to their Arab masters. They have great power of endurance, but they lack courage and they show a great deal of stupidity. It is almost hopeless to attempt to Christianise them. One old man, to whom a Catholic priest had patiently explained the future state of the unredeemed, made the brief reply: "I am an old man, I like to be near the fire."

The race is dying out, with the suppression of slave raiding.

The appendices give lists of altitudes, scientific collections (the botanical specimens not yet named) and articles of export, present and prospective.

There are 49 good illustrations and four maps.

Il Territorio Contestato tra la Venezuela e la Guiana Inglese. Lettera aperta al chiariss° Signor Comm. Dott. Clinio Silvestri, Console Generale degli Stati Uníti di Venezuela in Italia, Roma. Direzione ed Amministrazione del "Cosmos di Guido Cora," 74 Corso Vittorio Emanuele. 8vo. Torino, 1896.

In this "Open Letter," Prof. Cora makes reply to a printed remonstrance addressed to him by the Venezuelan Consul-General concerning a map of South America, published by Prof. Cora to show the distribution of the Italians in American countries.

The Consul General finds in this map a very serious error in the eastern boundary of Venezuela, and especially in the territory bounded by the *Sea of the Antilles*, the river Orinoco and the river Essequibo; a region which belongs, as he declares, to Venezuela.

According to Prof. Cora, the school map in question bears the date of 1891, and necessarily gives the limits previous to that date. Had there been a later edition of the map, he says, the Consul-General would have found the Venezuelan area considerably reduced on the west, in accordance with the decision rendered, March 16, 1891, by the Queen of Spain as arbitrator between Venezuela and Colombia.*

It excites Prof. Cora's surprise that he alone should be called upon to correct the boundary assigned by him to Venezuela, when his boundary agrees with that drawn in most of the maps now in existence, including those of greatest authority.

He cites the various editions of Stieler's Hand-Atlas, Kiepert's great map of northern tropical America, 1858, and his Hand-Atlas, Vivien de Saint-Martin and Schrader's Atlas Universel, and the Atlas de Géographie Moderne of Schrader, Prudent and Anthoine; to name only, he says, a few German and French cartographers of the first rank.

He fortifies his position by references to the historical record, and declares that the question between himself and the Consul-General is one of appreciation with regard to a still unsettled controversy.

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* This decision was in favour of Colombia, and Venezuela declined to abide by it.

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JULY–SEPTEMBER, 1896.

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BULLETIN

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THE TOPOGRAPHIC WORK OF THE U. S. GEOLOGICAL SURVEY IN 1895.

BY

HENRY GANNETT.

The progress made by this organization in its work of preparing the Topographic Atlas of the United States, from the beginning of the work in 1882 to the present time, is shown upon the accompanying map. About one-fifth of the area of the country, excluding Alaska, has been surveyed and mapped, the scales of the maps being about one mile to one inch, two miles to one inch, or four miles to one inch.

The areas surveyed are in many distinct bodies. Four States only, viz.: Massachusetts, Rhode Island, Connecticut and New Jersey, have been surveyed entirely, and the fact that the work has been thus early completed in these States has been due, in a great measure, to their co-operation.

Of certain other States a large proportion of the area has been completed. This is the case with West Virginia, nearly all of which has been surveyed; with Kansas, of which five-sixths of the area have been surveyed, and Virginia, where three-fourths have been surveyed. More than half of Maryland has been mapped, but in no other State is the proportion as large. Some work has been done in nearly every State in the Union, though in Delaware, Ohio, Indiana and Mississippi the amount is trifling, and in Michigan, Minnesota and Washington it is by no means large.

During the season of 1895 there were in the field thirty-three topographic parties, and in addition three triangulation parties The entire area mapped was 48,066 square miles, of which 42,386 consisted of areas which had not previously been mapped, while

5,680 square miles represented upon earlier maps were revised, since the scale and degree of detail given by these maps are not at present regarded as adequate for the delineation of the economic geology of the Appalachian and Rocky Mountain sections, where these areas are found. Classifying the area mapped by the scales upon which it is proposed to publish the results, it appears that 4,000 square miles are upon the scale of 1:62,500, or about a mile to an inch; the remainder being designed for the scale of 1:125,000, or about two miles to an inch.

The work of this season completes 75 atlas sheets, besides comprising parts of a number of additional sheets. The office work upon these sheets is completed and the sheets are ready for engraving.

The surveyed area is widely distributed. Commencing at the northeast, two sheets are in southern New Hampshire, one of them including the city of Keene, and the other Mount Monadnock. One sheet is in Vermont and five are in New York, mainly in the southern part of the Adirondack region. Upon the eastern shore of Maryland the equivalent of a sheet and a half, upon the two-mile scale, was mapped. In Virginia, one sheet, lying west of Richmond, and including the triassic coal field, was mapped, together with considerable revision in the southwestern part of the State. In western North Carolina there was much revision of earlier work done, as was also the case in Georgia and Alabama. In the latter State besides this revision work, a sheet comprising about a thousand square miles, and lying within the Black Warrior coal field, was mapped.

In western Tennessee a considerable area covering the newly discovered phosphate beds, was mapped, and moreover, considerable revision was done in the eastern part of the State.

One party was occupied throughout the season in the dense forests and swamps on the upper peninsula of Michigan, and an area of 400 square miles, comprising practically two atlas sheets, was completed. In Missouri an area of 1,250 square miles, including the celebrated iron districts of Pilot Knob and Iron Mountain, and the zinc region in the southeastern part of the State, was mapped. In the Dakotas areas amounting to 4,500 square miles were mapped, completing several atlas sheets, parts of which had been surveyed during previous seasons. In southern Nebraska also a number of sheets were completed by the survey of some 2,500 square miles, while in the western part of the State, in the valley of the North Platte, three sheets, or 3,000 square miles, were mapped. In Kansas some revision was done, and also in central Texas. In southern Texas an area of some 500 square miles was mapped near Eagle Pass, and in the western point of the State several sheets bordering upon the Rio Grande, the national boundary, were surveyed. The total area thus mapped in Texas is estimated at 3,000 square miles.

In Indian Territory topographic work has been going on coincidentally with the land subdivision work, and an area of 9,814 square miles, comprising all the Seminole, most of the Creek, and much of the Choctaw and Cherokee Nations, has been mapped.

In Colorado work has been carried on in two areas, one upon the Plains in the neighborhood of Trinidad, where an area of 2,000 square miles has been revised; the other area in the San Juan and La Plata mountains, consisting of two sheets upon the mile-to-an-inch scale. In eastern Wyoming, on and near the North Platte River, an area comprising three atlas sheets, upon the two-mile scale, has been mapped.

A special map has been prepared of Butte, Montana, and its immediate surroundings, upon the scale of two inches to one mile, for the detailed representation of this wonderful mining district.

In Idaho further inroads were made upon the unknown region of the Salmon River Mountains, and an area of nearly a thousand square miles was mapped, comprising some of the most rugged country in the State. In Washington an area of some 1,200 square miles, comprised in the comparatively low country at the west base of the Cascade Range, was mapped. This, owing to the extremely irregular character of the surface and the fact that it is densely covered with forests and fallen timber, render it one of the most difficult regions in the country to the surveyor. Work was commenced also in the Cascade Range itself. An astronomical determination of position was made at Ellensburg, at the east base of the mountains; a base line was measured and the expansion effected and work carried forward to the high summits of the Cascades. Another season will see the positions of many of these high peaks determined with accuracy and their heights measured.

In Oregon some work was done in the Rogue River valley, south of Roseburg, and on the Pacific coast near Coos Bay.

In California the work was carried on in two different regions. One of these lies south of the Bay of San Francisco, and comprises the regions adjacent to Leland Stanford University, the City of San José, and the Mount Hamilton Observatory, thus including the whole breadth of the beautiful Santa Clara valley and extending far into the Coast ranges on either side. The other area is farther south, in the neighborhood of San Luis Obispo.

When compared with the area yet to be mapped, it seems that this work is going on with exasperating slowness. At the rate of 40,000 square miles a year, it will require sixty or seventy years yet to complete the country, without taking Alaska into consideration, and this seems a long time to wait for a completed map of the United States. When compared, however, with the output by other organizations, both in this country and in European countries, the area annually surveyed appears very large. There is probably no country on the earth in which so large an area is annually mapped as by this organization.

HENRY GANNETT.

MEXICO.

BY

MATIAS ROMERO.

Since the American Geographical Society of New York did me the honor of electing me one of its honorary members, I have felt that I owed it a debt which I could pay only by sending it a contribution about Mexico. The pressure of my official duties in Washington, on the one hand, and my inability to treat properly the many subjects connected with a description of Mexico, to which was added the difficulty of compressing them into a few pages, on the other, have delayed this work much longer than I desired or expected.

A club of this city requested me some time ago to deliver a lecture on Mexico, and, as I had not the time to prepare one, I consented to give an informal talk on the subject, which I did on January 16, 1888. Most of my talk was taken down by a stenographer, and it has been the basis of the present article, which I hope will at least serve to call attention to Mexico and awaken a desire for reading other and better articles and books on that country, written by far more competent men. I have added to those remarks considerably, and have borrowed from descriptions of others a portion of what appears under the headings of Geology, Orography and Fauna.

I think this work would not be complete if I omitted to include some of the most important statistical information concerning Mexico, and I therefore will insert it in this article.

LOCATION, BOUNDARIES AND AREA.

Mexico is situated between 14° 24′ and 32° 32′ north latitude, and between 86° 53′ and 117° 7′ 31″ west longitude of the Meridian of Greenwich, embracing therefore 18° 8′ of latitude, and 30° 14′ 31″ of longitude. It has an area of 767,226 square miles. It is bounded on the north by the United States of America, the boundary being defined by the treaties of February 2, 1848, and December 29, 1853, by which Mexico ceded to the United States over one-half of her former territory, which consisted of the States of Texas, Nevada, Utah and California and parts of Colorado, Wyoming and Kansas, and the Territories of New Mexico, Arizona and a portion of the Oklahoma Territory, comprising an area of 568,103 square miles exclusive of Texas, and, including this State, whose independence was recognized by Mexico by the former treaty, of 930,590 square miles. The boundary with the United States begins at the mouth of the Rio Grande River on the Gulf of Mexico, and follows this river for 1,136 miles beyond El Paso, Texas, at the point where it strikes the parallel 31° 47′ north latitude, and thence south to the parallel 31° 20′ north latitude: from there west along this parallel till the 111th meridian of longitude west of Greenwich; thence in a straight line to a point on the Colorado River 20 English miles below the junction of the Gila; thence up the middle of said River Colorado to the intersection with the old line between Upper and Lower California, and thence to a point on the Pacific Ocean distant one marine league due south of the southernmost point of the Bay of San Diego; the total distance from El Paso to the Pacific being 674 miles. The boundary line with the United States runs from southeast to northwest, the mouth of the Rio Grande being in 25° 57′ 21″ north latitude, while the boundary on the Pacific reaches 32° 32′ 1″ 34‴. Mexico has, therefore, on the western, or Pacific side, 6° 33′ 40″ 34‴ of latitude more than on the eastern or the Gulf of Mexico side. The whole extent of the boundary line between the two countries is 1,833 miles.

The boundary with Guatemala was fixed by the treaties of September 27th, 1882, and April 1st, 1895, and it runs from the Pacific coast, at the mouth of the River Suchiate, along that river and across the main range to the Tacana volcano, and the Buenavista and Ixbul heights, and thence eastwards along the parallel of 16° 4′ to the left bank of the Rio Usumacinta, whose course it then follows to within 15 miles south of the town of Tenosique in the State of Tabasco, Mexico. From that point the line runs eastward along a parallel till the meridian located one-third of the distance between the squares of Tenosique and Sacluc in Guatemala; from there north along said meridian till the parallel of 17° 49′ north latitude, and thence along said parallel, which falls on the Atlantic Ocean, about the southeast corner of Yucatan.

To the southeast of Yucatan follows the territory of Belize, occupied by a British Colony under a permit granted to them by the Spanish Government to cut wood, within the limits stated in the treaty concluded between the Kings of Great Britain and Spain on November 3, 1783, and amended on July 14, 1786, with undefined limits. The southern end of the Guatemalan line on the Pacific is in 14° 24′ north latitude, while the northern end, on the Caribbean

Sea, is in 17° 49′ north latitude, being a difference of 3° 25′ in favor of the latter. The calculated length of the southern boundary is 642 miles.

Mexico is bounded on the east by the long curve of the Gulf of Mexico and by the Caribbean Sea and is 1,727 miles long; on the west it is washed by the Pacific Ocean, its coast describing the arc of a still larger circle, for a length of 4,574 miles; but after passing the City of Mexico, going towards Guatemala, where the country makes a turn toward the east, the Gulf of Mexico forms the northern border and the Pacific Ocean the southern border.

Mexico has the shape of a cornucopia, with its narrowest end tapering to the southeast, its convex and concave sides facing the Pacific and the Atlantic, respectively, and its widest end towards the north, or the United States, and this has been considered allegorically as a sign that it will pour its wealth and products into this country. I look forward to the time, which I do not think far distant, when we shall be able to provide the United States with most of the tropical products, such as sugar, coffee, tobacco, etc., which they now import from several other countries.

The widest portion of Mexico is, therefore, its northern boundary with the United States. The general direction of the country is from southeast to northwest, and as it extends south the country converges until it reaches latitude 19°, about the latitude of the City of Mexico, when it makes a decided turn towards the east. The narrowest point is the Isthmus of Tehuantepec, about 100 miles from one ocean to the other, where Central America proper begins, and expands again toward Yucatan and Chiapas until it reaches the boundary with Guatemala.

The broken surface of Mexico formerly made travelling there very difficult, and for that reason the country was but little known, even by Mexicans themselves, as its configuration did not allow of the building of good roads, and to travel any considerable distance it was necessary to go by mule paths, without comfortable inns, and running great risks, owing to the disturbed condition of the country. It required, therefore, time, expense, endurance and an object, to travel widely there. I was always anxious to know as much as possible of the country, and I have made long trips solely for the purpose of studying certain regions, and I think that before the railway era, I was perhaps one of the Mexicans who knew most of the country, and could, therefore, most easily realize the difficulty of knowing it thoroughly. From this it can be readily understood how difficult it would be for a foreigner, who does not know anything of the country and is ignorant of its language, to understand it by a few days' sojourn there. Yet many travellers who have been in Mexico only a few days write about it on their return just as if they knew it perfectly well, making necessarily many serious and sometimes laughable mistakes.

The natural beauties of Switzerland are well known; but to me that country can hardly be compared with Mexico, as everything in Mexico is on a grander scale. In the latitude in which Switzerland is situated the snow line is quite low, and, therefore, most of the peaks of the Swiss mountains, while not so high as the Mexican mountains, are covered with perpetual snow, which embellishes the country, and the melting in summer of the snow on its mountains supplies the beautiful lakes of that country with fresh water. Therefore only in the beauty of many snow peaks, beautiful fresh water lakes and good roads and fine hotels, has Switzerland the superiority over Mexico.

Although most of Mexico is located on the North American Continent proper, considering that the Isthmus of Panama divides North from South America, a large portion of it lies in Central America. Geographically speaking, Central America is the portion of North America embraced between the Isthmuses of Tehuantepec and Panama, and of this vast territory Mexico holds about one-third. In a paper published in the BULLETIN OF THE AMERICAN GEOGRAPHICAL SOCIETY of New York, of March 31, 1894, I dealt especially with this subject.

Yucatan has very little of the configuration of Mexico proper. It is a level country formed very likely by coral reefs and beds, and its ruins show it to have been the seat of a high civilization and an advanced people. Dr. Augustus Le Plongeon, a French savant, who has passed many years in Yucatan, studying its magnificent ruins, has written and published during the present year a book, entitled "Queen Moó and the Egyptian Sphinx," in which he shows that the Empire of the Mayas, which had its seat in Yucatan, was the cradle of civilization and that from there it went to India, Egypt and finally to Greece and Western Europe.

GEOLOGY.

The Geology of Mexico has been but imperfectly studied. In the higher ranges the prevailing formations are granites, which seem also to form the foundations of the plateaus, above which rise the traps, basalts, mineral-bearing porphyries, and more recent lavas. Hence Lyell's theory that Mexico consisted originally of granitic ranges with intervening valleys subsequently filled up to the level of the plateaus by subterranean eruptions. Igneous rocks of every geologic epoch certainly form to a large extent the superstructure of the central plateau. But the Mexican table-land seems to consist mainly of metamorphic formations which have been partly upheaved, partly interpenetrated, and overlaid by igneous masses of all epochs, and which are chiefly represented by shales, greywacke, greenstones, silicious schists, and especially unfossiliferous limestones. All these formations are alike remarkable for the abundance and variety of their metalliferous ores, such as silver, silver glance, copper and gold. Gneiss and micaceous schists prevail in Oaxaca and on all the southern slopes facing both oceans. But the highest ranges are formed mainly of plutonic and volcanic rocks, such as granites, syenites, diorites, mineral-bearing trachytes, basalts, porphyries, obsidian, pearlstone, sulphur, pumice, lavas, tufa and other recent volcanic discharges. Obsidian (itzli) was the chief material formerly used by the natives in the manufacture of their cutting implements, as shown by the quarries of the Cerro de las Navajas (Knife Cliff) near Zimapan. Vast deposits of pumice and the purest sulphur are found at Huichapam and in many of the craters. But immeasurably the most valuable rocks are the argentiferous porphyries and schists of the central plateau and of Sinaloa, unless they are destined to be rivalled by the auriferous deposits of Sonora. Horizontal and stratified rocks, of extremely limited extent in the south, are largely developed in the northern states, and chalk becomes very prevalent towards the Rio Grande and Rio Gila valleys. To this chalk and to the sandstones are probably due the sandy plains which cover vast tracts in North Mexico, stretching thence far into New Mexico and Texas. Here the Bolson de Mapimi, a vast rocky wilderness inhabited until recently by wild tribes, occupies a space of perhaps 50,000 square miles in Coahuila and parts of the surrounding States.

None of the horizontal layers seem to be very rich in ores, which are mainly found in the metamorphic, palæozoic and hypogene rocks of Durango, Chihuahua and the south. Apart from Sinaloa and Sonora, which are now known to contain vast stores of the precious metals, nearly all the historical mines lie on the south central plateau at elevations of from 5,500 to 9,500 feet. A line drawn from the capital to Guanajuato, and thence northwards to the mining town of Guadalupe y Calvo of Chihuahua, and southwards to Oaxaca, thus cutting the main axis of upheaval at an angle of 45°, will intersect probably the richest known argentiferous region in the whole world.

Of other minerals the most important are copper, found in a pure state near the city of Guanajuato, and associated with gold in Chihuahua, Sonora, Guerrero, Jalisco, Michoacan and elsewhere; iron in immense masses in Michoacan and Jalisco, and in Durango, where the Cerro del Mercado is a solid mountain of magnetic iron ore; lead associated with silver, chiefly in Oaxaca; tin in Michoacan and Jalisco; sulphur in many craters; platinum, recently found in Tlazcala and Hidalgo; cinnabar, also recently found in Morelos and Guerrero; "steppe salt" in the sandy districts of the north; "bitter salt" at Tepeyac; coal at various points; bismuth in many parts; marble, alabaster, gypsum, and rock-salt in great abundance throughout the plateaus and the sierras. In 1882 there were open altogether 569 mines:—541 silver, 14 gold, 4 copper, 4 lead, 3 salt, 2 coal and 1 mercury.

OROGRAPHY.

Mexico is traversed by two Cordilleras or high ranges of mountains running almost parallel to the coast, one along the Gulf of Mexico and the other along the Pacific Ocean. The former runs from ten to one hundred miles from the coast, leaving an imperceptibly inclined plane from the sea to the foot of the mountains; while the Cordillera on the Pacific side runs, on the whole, very near the coast, leaving a very narrow strip of land between the same and the sea, and from this run several branches in different directions. The most continuous range is the Sierra Madre of the Pacific, which may be traced, at a mean elevation of over 10,000 feet, from Oaxaca to Arizona. Parallel to this is the Lower Californian range (Sierra de la Giganta) 3,000 feet, which, however, falls abruptly eastwards, like the Atlantic escarpments. The California peninsula seems to have been detached from the mainland when the general upheaval took place which produced the vast chasm now flooded by the Gulf of California. Corresponding with the Sierra Madre on the west are the more interrupted eastern scarps of the central plateau, which sweep around the Gulf of Mexico as the Sierra Madres of Nuevo Leon and Tamaulipas at an elevation of about 6,000 feet. These are crossed by the routes from Tula to Tampico, the highest pass being 4,820 feet; from Saltillo to Monterey 3,400, and at several other places.

Of the central cross ridges the most important orographically and historically is the Cordillera de Anahuac, which surrounds the

Mexican (Tenochtitlan) and Puebla Valleys, and which is supposed to culminate with Popocatepetl (17,853 feet) and Ixtaccihuatl (15,705 feet). But these giants belong to a different or rather more recent system of igneous upheaval, running from sea to sea between 18° 59′ and 19° 12′ N. in almost a straight line east and west, consequently nearly at right angles to the main axis of the central plateau. The line is clearly marked by several extinct cones and by five active or quiescent volcanoes, of which the highest is Popocatepetl, lying south of the capital, nearly midway between the Pacific and the Atlantic. East of the central point of the system are Citlaltepetl, better known as the peak of Orizaba (17,176 feet), on the coast south of Vera Cruz, to which correspond on the west the recently upheaved Jorullo (4,000 feet) in Michoacan, Colima (12,800) near the coast in Jalisco, and the volcanic Revillagigedo group in the Pacific. South of this line and nearly parallel, are the Sierras of Guerrero, and southeast of the Tehuantepec Isthmus those of Oaxaca and Chiapas towards the Guatemala frontier. In the same direction run the Islands of Cuba and Hayti, which probably belong to the same Central American system.

In the course of centuries these high mountains have become disintegrated by the rains and other natural elements and a great many spaces between them filled up, forming a series of valleys and other spots quite delightful in climate and very rich in agricultural resources. This series of valleys, which we call the Central Plateau, runs from about 150 miles east of the City of Mexico, traversing all of Mexico in a northwesterly direction. So level is the plateau that even when there were no wagon roads in Mexico one could travel in a carriage from the City of Mexico to Santa Fé. Baron Humboldt and other geologists considered the Cordilleras of Mexico as a portion of the Andes of South America, which originate in Patagonia, extending over the whole of that continent; but researches were made specially by a corps of engineers, who surveyed Mexico during the French Intervention, and these seem to have arrived at a different conclusion, and consider that the Andes proper end in Panama, and that the Mexican Cordilleras are entirely independent from that lofty chain of mountains.

In contrast with the plains and at times barren districts of the Central Plateau, it is occasionally broken by depressions of the soil, known as barrancas, descending sometimes 1,000 feet and measuring several miles across, which are covered with a luxuriant vegetation of trees and shrubs, and watered by small streams running through the middle of the valley. Among the most remarkable ones are the barranca de Beltran descending the western slope from Guadalajara to Colimá, and the barranca de Mochitilte from Guadalajara to Tepic.

The following are the principal mountain peaks of Mexico, the first ten being volcanoes, with their heights according to the most recent measurements:

MOUNTAINS.	STATES.	ELEVATION IN FEET.
Popocatepetl	Mexico	17,540
Orizaba	Veracruz and Puebla	17,176
Toluca	Mexico	16,610
Ixtacihuatl	Mexico and Puebla	15,705
Colima	Colima	12,000
Zapotlan el Grande	Jalisco	9,293
San Martin or Tuxtla	Veracruz	9,708
Tancitaro	Michoacan	9,506
Jorullo	Michoacan	....
Soconusco	Chiapas	7,436
Guarda	Mexico	16,748
Ajusco	Mexico	15,682
Zacualtipan	Mexico	14,858
Cofre de Perote	Veracruz	14.309
Zempoaltepec	Oajaca	10,543
La Brea	Guerrero	11,789
Pico de Quinceo	Michoacan	10,603
Veta Grande	Zacatecas	9,041

HYDROGRAPHY.

The Mexican coasts, washed by the Caribbean Sea and the Gulf of Mexico, are low, flat and sandy, except near the mouth of the Tabasco River, where at some distance from the coast appear the heights of San Gabriel, extending north-east and south-west for several miles; but the majestic mountains of Veracruz, specially the volcano of Orizaba, visible for many leagues to seaward, form a picturesque background which relieves the monotony of the shore region of that State. On the Pacific side the coasts, although generally low, are here and there roughened by spurs extending from the Cordillera to the ocean.

The principal gulfs are those of Mexico, California and Tehuantepec, the first of which ranks among the largest in the world.

We are not blessed with good harbors on the Gulf Coast. Veracruz is an open roadstead, and we are now spending large sums of money in trying to make it a good port. Our best harbors are on the Pacific Coast, as Acapulco, which is a large one, Manzanillo, a very fine, although a very small one, and La Paz, on the Gulf of California. By artificial means we expect to improve our harbors considerably.

The more noteworthy bays are those of Guaymas, Santa Barbara, Topolobampo and Navachiste, in the Gulf of California; Concepción, La Paz and Muerto, on the east coast of the same gulf; San Quintin, Magdalena and Amejas, in the Pacific Ocean on the coast of Lower California; San Blas and Valle de Banderas, on the coast of Tepic.

We have no lakes as large as those with which the United States is favored, and the Lake of Chapala, a beautiful spot where country houses are now being built, is the largest lacustrine basin in Mexican territory. The Valley of Mexico has seven lakes, one of fresh and six of salt water. The other lakes in Mexico are Catemaco, in the State of Veracruz; Cairel and Carpintero, in the State of Tamaulipas; Encantada, in Tabasco; Bacalar, in Yucatan; Alcuzague, in Colima Cuitzeo; Tacascuaro and Patzcuaro, in Michoacan; Yuriria, in Guanajuato; and Meztitlan, in Hidalgo.

Mexico has a great many islands, although not any of very great area, situated near the coast, the greater number of which are uninhabited, although some of them are very fertile, and could be the seat of a large population. Among the most important are: El Carmen, the largest in the Gulf of Mexico; San Juan de Ulua and Sacrificios, opposite the port of Veracruz; Mujeres, in the Caribbean Sea; Guadalupe, on the west coast of Lower California, and near the coast of Tepic the Tres Marias group; at some distance from the coast of Colima the Revillagigedo group, belonging to that State, and adjoining the coast of the State of Michoacan the Alcatraz Island.

As I have already stated, Mexico has a very broken surface, with high mountains, causing streams to run down a very inclined plane, forming torrents with rapid cascades, which contribute to embellish the natural features of the country. This, however, prevents us from having large navigable rivers, and furnishing a cheap way of transportation, which is one of the greatest advantages the United States has, and which so largely contributed in its early days to the development of the country, making transportation to long distances both easy and cheap. While the torrents descending from the mountains afford an immense water-power—which, in the course of time, can be used as motor for industrial purposes—they meet when they reach a valley and run smoothly there through a ravine until finally they reach the coast, and it is therefore only at a comparatively small distance from the coast that they can be made navigable.

Our principal rivers, measuring their positions from north to south, are the Rio Grande—which from El Paso, Texas, to the sea, is the boundary line between the two countries and which used to be a large river; but, as it rises in Colorado and passes through New Mexico, and the inhabitants of both have taken for irrigation purposes most of the water that it carries, it becomes entirely dry during the dry season after the freshets, very much to the distress of the inhabitants of its borders from El Paso to Ojinaga, especially on the Mexican side, which has been inhabited for three hundred years, the people using the water for irrigation—on the other side there being no population—and now they find that their farms are entirely worthless for want of water. After passing Presidio del Norte, now called Ojinaga, the Rio Conchos and other tributaries of the Rio Grande River supply it with water, although not to the amount it had before the water was taken by Colorado and New Mexico. The Mescala, or Balsas River, rises in the Central Plateau near the Valley of Mexico, passes by the State of Puebla to the southwest, by Mixteca and Oaxaca, and finally empties into the Pacific at Zacatula. As indicated by its name it is, to a limited extent, navigable along its lower reaches; above the bar it is accessible to small craft, which, higher up, are arrested by rapids, whirlpools and a high cascade. The Pánuco River rises north of the Valley of Mexico. Under the names of Tula and Montezuma it describes a vast semi-circular bend towards the west across the Hidalgo uplands and collects the waters of the Huasteca of Vera Cruz and Tamaulipas, beyond which it is joined by the various streams flowing from Querétaro, and finally empties into the Gulf of Mexico at the Port of Tampico. The Tampico bar has been improved by jetties, and now steamers drawing 24 feet of water can enter easily, thus making that harbor the best on our Gulf coast. The Rio Lerma or Santiago, the Tololotlan of the Indians, is also a considerable stream. By the riverain populations it is, in fact, known as the Rio Grande, while the inhabitants of Michoacan call it also Cuitzeo, from the large lake situated in their province. It rises in the State of Mexico in the very centre of the Anahuac Plateau, and its farthest sources, issuing from underground galleries, descend from the Nevado de Toluca down to the twin lake of Lerma, the remains of an inland sea which formerly filled the Upper Toluca Valley north of the Nevado volcano. At its issue from the lake, or rather marshy lagoon, the Lerma stands at the great altitude of 8,600 feet, and during its winding northwesterly course across the plateau, the incline is very slight. In this upland region it is swollen by several affluents, some of which, like the main stream itself, flow from lakes dotted over the tableland. After completing half of its course at La Barca, the Lerma is still over 5,600 feet above sea level. Here, some 280 miles from its source, it enters the large lake Chapala, near its eastern extremity; but about twelve miles below the entrance it again emerges through a fissure on the north side of the lake, and still continues to flow throughout its lower course in the same northwesterly direction.

The Grijalva and Usumacinta rivers, rising in the State of Chiapas, after being joined by many others, some of them coming from Guatemala, empty into the Gulf of Mexico by one of its mouths at the City of Frontera, in the State of Tabasco. The Papaloapam River rises in the State of Oaxaca, passes through the State of Vera Cruz and empties into the Gulf of Mexico at the town of Alvarado, a few miles south of Vera Cruz.

The rains increase considerably the amount of water in the rivers, but as their duration is not very long this soon subsides. When the streams rise near the sea, as is the case on the coast of Chiapas on the Pacific, they become so swollen immediately after the rains that it is impossible to ford them, and as there are no bridges, it is necessary to wait until early the next day when the freshet has subsided.

Springs are rare, and a great many of the rivers run in deep mountain beds, without receiving smaller tributaries, while the rapid evaporation on a light soil, covering porous rocks, leaves the surface dry and hot and unable to support any vegetation beyond the cactus and low grasses.

We are blessed with quite a number of mineral springs, although very few of them are used, most of them being at places not easily accessible, but in this regard I do not think we have any cause to envy any other country.

CLIMATE.

By looking at the map it will be perceived that Mexico, being intersected by the Tropic of Cancer and stretching across eighteen parallels of latitude, must, from its position alone, necessarily enjoy a great diversity of climate. But from its peculiar configuration this feature is affected far more by the altitude of the land than by its distance from the pole or the equator. This is especially true of the more fertile and populous section lying within the torrid zone, where three distinct climatic regions are distinguished, not according to their horizontal, but according to their vertical position. The warm climate has the heat of the torrid zone and prevails on the sea coast in the sandy and marshy tracts fringing the Gulf of Mexico and the Pacific Ocean, in other low places below 3,000 feet above the level of the sea, and in some of the valleys higher than that, but protected entirely from the winds. But the night breezes refresh the temperature in the evening and make it bearable during the day, the heat never being so oppressive as it is in summer in the more northern latitudes. This region is also much refreshed in summer by the rains, which are abundant and fall regularly during that season. The heat of the sun increases considerably the evaporation from the sea, and when the evaporation reaches the cool atmosphere of the sky, it is naturally condensed into water and falls in this region. The rains begin generally in June, are considerably increased in July, and end in November, although this varies in different regions, the rains lasting longer in those near the sea than in the inland districts. They are so abundant that they form the main reliance of the agricultural industry, and there are few regions which use water for irrigation, depending entirely upon the rainfall; therefore, when by some atmospheric phenomena, the rains are late or very scarce, in a year we have a famine in Mexico, which can now be averted by importing cereals through our railroads, as was the case in 1893. The rains fall regularly and at fixed intervals, that is, about from one to three hours every day, and after the rain is over, the atmosphere is clear and pleasant, and in well drained places, the ground becomes dry, so that it causes no inconvenience to the inhabitants.

The rains have such a decided effect on the atmosphere that in most of the country the seasons are divided into the rainy and dry season, and very few realize what spring and fall mean. As our climate is so even, the trees do not lose their leaves at any given time, but one by one as they grow old and die; and as the leaves die they are replaced gradually and imperceptibly by new ones, so that the phenomenon familiar to northern latitudes, of trees losing all their leaves in the autumn and regaining them in the spring, is quite new to anybody going to a temperature that has both extremes.

The differences of climate depending upon the different degrees of altitude are so great in Mexico that the vegetable products of this vast country include almost all that are to be found between the equator and the Polar circle.

The mean temperature in the hot region varies from 77 to 82 degrees Fahrenheit, seldom falling below 60, but often rising to 100 degrees, and in the sultry districts of Vera Cruz and Acapulco to

105 degrees, although the heat is not oppressive as is the summer heat of the eastern portions of the United States. The vegetation is, of course, in consequence entirely tropical. In the southern region the climate on both seaboards may be described as humid, hot and rather unhealthy, and in places where stagnant water and marshes exist—which are often found on the coast on account of the sea water flowing in and remaining there—intermittent and remittent fevers prevail, and in some localities during the summer yellow fever and black vomit are endemic. These conditions could easily be remedied by proper drainage of the swamps and marshy districts.

The heat of the Gulf of Mexico when the atmosphere begins to cool in the Polar regions causes a depression in the barometer, and consequently very strong north winds, which sweep over the coast with terrible force, causing great havoc. They generally begin in September and last until the winter season sets in about December. As the country is narrow, the effect of the north wind is felt all over it and that is the prevailing wind. In the City of Mexico, for instance, notwithstanding its altitude and that it is protected by high mountains from the northern winds, the temperature falls when the northerns prevail on the Gulf coast and it becomes cloudy and drizzly, and the same effect is felt, more or less, in other portions of the country. As the country narrows towards the southeast, especially at Tehuantepec, the northern wind blows without any obstacle and its force and effects are felt all over it. The districts in the mountains bordering the Pacific are affected in the same way as the City of Mexico.

From 3,000 to 5,000 feet above the level of the sea is located our temperate zone, which succeeds the hot zone in a vertical position, and embraces all the higher terraces, and portions of the central plateaus themselves. The mean temperature is from 62 to 70 degrees Fahrenheit, varying not more than 4 to 5 degrees during the season, thus making one of the very finest climates on the face of the earth. In this privileged region both extremes of heat and cold are unknown and it has several cities—Jalapa and Huatusco in the State of Vera Cruz; Chilpancingo in Guerrero, Ameca in Jalisco, and many others too numerous to mention here. As these places are generally located on the slopes of mountains and not far removed from the ocean, the evaporations from the sea form clouds which are detained in their course by the high peaks and are precipitated into rain. In this region the semi-tropical productions are abundant, and with them are often combined the products of tropical and cold regions. I have seen in my own native place, the City of Oaxaca, located in the temperate region, a farm where wheat and sugar cane were growing on the same piece of ground.

The cold region is located from 7,000 feet above the sea level upwards, and has a mean temperature of from 59 to 63 degrees Fahrenheit. Most of the grand central plateau is located in this region, except in such places as are in a great depression of ground and in deep ravines, where a warm temperature and tropical products are found. The rainfall is about five times less than in the temperate zone. This region, of course, produces all the growths of the cold latitudes, as wheat, oats, apples, etc., etc.

The portion of the country that is most thickly inhabited lies in the Central Plateau, and is quite high above the level of the sea, and so sheltered from the winds and storms by the mountains as to make the climate even, temperate and delightful. The impression prevails in the United States that Mexico, lying to the south of this country and running towards the equator, must be much warmer than this country; but this is not so. Often in warm places, like the lowlands on the coast, we do not have the extreme hot weather that is experienced in summer in the United States. The sea breezes refresh the atmosphere at night and cool it considerably, making, therefore, a very great contrast with the summer heat in this country. The medium climate of the Valley of Mexico, for instance, which is the one that has been best observed and understood, varies comparatively little between summer and winter, and the greatest variations are between day and night on the same day.

The climatic conditions of Mexico are undergoing great changes on account of the destruction of the forests. The country had formerly a great deal of rain and much humidity of atmosphere, being covered with thick forests, but in the absence of coal mines and with the difficulty of transportation to contend with, even supposing coal had been found in it, the population has had to depend entirely for their supply of fuel, upon charcoal, and this has in the course of time denuded the mountains, changing very materially the climatic conditions. But in the lowlands, being thinly inhabited, the case is different, and the country is still so thickly wooded that it is impossible to pass through it, unless an open path is made with a great deal of difficulty, by felling very high trees. In this region abound forests of mahogany, cedar, rosewood, etc. The destruction of the forests has increased considerably since the building of railroads, because wood has not only been used for railway ties, but also as fuel for the locomotives and for other industries established in the country as a natural consequence of railways, thus considerably increasing the demand for fuel. We have already located several coal beds, as the Sabinas in Coahuila, some of which are being used to a considerable extent, and it is to be hoped that these will put an end to the destruction of our forests. The Mexican Government has, I think, been contemplating the idea of prohibiting the use of wood for the locomotives and railway ties. Experience has shown that in tropical countries iron ties last much longer and are, on the whole, cheaper than wooden ones, and our supply of coal will soon be ample enough to furnish all the fuel necessary for the railways and mining industries.

As a whole, the Mexican climate, if not one of the healthiest, is certainly one of the most delightful in the world. The zone of "temperate lands," oceanic slopes, enjoy an everlasting spring, being exposed neither to severe winter, nor to intolerable summer heats; in every glen flows a rippling stream; every human abode is embowered in leafy vegetation; and here the native plants are intermingled with those of Europe and Africa. Each traveller in his turn describes the valley in which he has tarried longest as "the loveliest in the world"; nowhere else do the snowy crests or smoking volcanic cones rise in more imposing grandeur above the surrounding sea of verdure, all carpeted with the brightest flowers. In these enchanting regions there is still room for millions and millions of human beings.

The following table shows the meteorological conditions of some Mexican stations, taken in the direction from north to south:

STATIONS.	LATITUDE.	HEIGHT FEET.	MEAN TEMPERATURE.	RAINFALL INCHES.
Monterey (1888)	25° 40′	1,636	70° F.	137
Mazatlan (six years)	23° 11′	150	76° F.	39
Zacatecas (1888)	22° 47′	8,100	58° F.	19
San Luis Potosi (2 years).	22° 5′	6,230	62° F.	16
Leon (1888)	21° 7′	5,920	65° F.	35
Guanajuato (1888)	21° 1′	6,645	63° F.	33
Guadalajara (six years)	20° 41′	5,180	72° F.	34
Mexico (12 years)	19° 26′	7,400	60° F.	30
Colima (15 years)	19° 12′	1,655	78° F.	42
Puebla (2 years)	19°	7,110	60° F.	39
Oaxaca (1879)	17° 3′	5,108	67° F.	38

It will be interesting to insert here a statement of the maximum and minimum temperatures of several cities of Mexico, located both at the sea level, like Merida and Mazatlan, and the higher portions of the Central Plateau, like the City of Mexico and Pachuca, and at different altitudes above the sea level, like Jalapa, San Luis Potosi, Oaxaca, etc., which show how mild the climate of Mexico is.

CITY OF MEXICO.

Maximum temperature in the shade	84°9	May 5th
Minimum temperature in the shade	32°9	Jan. and Feb.
Maximum temperature in winter	72°	December
Minimum temperature in winter	32°9	Jan. and Feb.

PUEBLA. (STATE OF PUEBLA.)

Maximum temperature in the shade	83°8	April
Minimum temperature in the shade	32.9	January
Maximum temperature in winter	74.7	February
Minimum temperature in winter	32.9	January

OAXACA. (STATE OF OAXACA.)

Maximum temperature in the shade	93°7	May
Minimum temperature in the shade	32.4	December
Maximum temperature in winter	83.1	February
Minimum temperature in winter	39.2	Jan. and Dec.

JALAPA. (STATE OF VERACRUZ.)

Maximum temperature in the shade	89.6	April
Minimum temperature in the shade	33.8	February
Maximum temperature in winter	87.1	December
Minimum temperature in winter	33.8	February

QUERETARO. (STATE OF QUERETARO.)

Maximum temperature in the shade	90.1	April and June
Minimum temperature in the shade	32.9	January
Maximum temperature in winter	80.4	December
Minimum temperature in winter	32.9	January

GUANAJUATO. (STATE OF GUANAJUATO.)

Maximum temperature in the shade	91.9	April
Minimum temperature in the shade	36.0	January
Maximum temperature in winter	82.0	February
Minimum temperature in winter	36.0	January

LEON. (STATE OF GUANAJUATO.)

Maximum temperature in the shade	91.6	May and June
Minimum temperature in the shade	32.0	February
Maximum temperature in winter	77.0	February
Minimum temperature in winter	32.0	February

SAN LUIS POTOSI. (STATE OF SAN LUIS POTOSI.)

Maximum temperature in the shade	89.2	May
Minimum temperature in the shade	26.1	February
Maximum temperature in winter	73.4	December
Minimum temperature in winter	26.1	February

MORELIA. (STATE OF MICHOACAN.)

Maximum temperature in the shade	87.8	April
Minimum temperature in the shade	37.4	January
Maximum temperature in winter	79.2	February
Minimum temperature in winter	37.4	January

PACHUCA. (STATE OF HIDALGO.)

Maximum temperature in the shade	80.2	May
Minimum temperature in the shade	32.4	December
Maximum temperature in winter	77.0	December
Minimum temperature in winter	32.4	December

REAL DEL MONTE. (STATE OF HIDALGO.)

Maximum temperature in the shade	80.2	March
Minimum temperature in the shade	31.6	January
Maximum temperature in winter	74.1	January
Minimum temperature in winter	31.6	January

SALTILLO. (STATE OF COAHUILA.)

Maximum temperature in the shade	89.6	April
Minimum temperature in the shade	12.2	February
Maximum temperature in winter	75.7	January
Minimum temperature in winter	12.2	February

MÉRIDA. (STATE OF YUCATAN.)

Maximum temperature in the shade	103.6	April and June
Minimum temperature in the shade	47.8	February
Maximum temperature in winter	92.8	January
Minimum temperature in winter	47.8	February

MAZATLAN. (STATE OF SINALOA.)

Maximum temperature in the shade	91.0	September
Minimum temperature in the shade	56.8	February
Maximum temperature in winter	84.0	December
Minimum temperature in winter	56.8	February

MEXICO AS A SANITARIUM.

The mild nature and evenness of most of our climate is very favorable to certain diseases—especially pulmonary ones—and when that advantage becomes well known the Central Plateau of Mexico will be the best sanitarium for lung diseases, and especially for tuberculosis. Other lung diseases requiring a warmer climate could find desirable places in certain valleys in the temperate zone like Cuantla, Cuernavaca, Tasco, Iguala and others. These very conditions, namely, the even and mild climate both in summer and winter, will make it a country visited by thousands of pleasure or health seekers who wish to escape the extremes of the northern climate. Even now we would have a much larger travel from this country, if we had convenient accommodations for travellers, but our hotels are not yet as comfortable as those in the United States.

FLORA.

This short and imperfect description of the climate of Mexico will show that we raise all the products of the three different zones into which the earth is divided, and the most peculiar thing is that we can raise them almost on the same ground. By going only a few miles, for instance travelling on horseback four or five hours, from a low to a high place, we change from the torrid to the temperate zone, and therefore we can have the products of both with comparatively little trouble, and by going four or five hours higher we change from the temperate to the frigid zone, and the advantage of this position can only be realized by those who have actually seen and done it.

Mexico is a favored country for flowers. They grow wild in a great many places and they can be raised at a very low figure, as there is no need of hot-houses or any other expensive appliance to cultivate them. The Indians in the small towns around the City of Mexico make a business of raising flowers, and they sell handsome bouquets, as artistically made as any in this country, for a mere trifle. A bouquet which, for instance, in New York would cost $5 in winter, could be had in the City of Mexico all the year around for 25 cents, and I look forward to the time when flowers will be exported in large amounts from Mexico to the United States.

The magnificent arboreal vegetation embraces 114 different species of building timber and cabinet woods, including oaks, pines, firs, cedars, mahogany, rosewood and so forth; 12 species of dye-woods; 8 of gum trees: the cacao and India rubber, copal, liquid-ambar, camphor, turpentine pine, mezquite (yielding a substance similar to gum-arabic), dragon tree, and the almácigo or callitris quadrivalvis, from which sandarac is extracted. Among the oil-bearing trees and plants, of which there are 17 varieties, are the olive, cocoa palm, almond, sesame, flax, the tree yielding the Balsam of Peru, and so forth.

There are 59 classified species of medicinal plants, and many more are mentioned by botanists as still unclassified by science.

Of the many delightful fruits which grow in the tropical regions, only a few—the pineapple, the banana and the cocoanut—are used in this country, the orange being more of a semi-tropical fruit. The others require, as all fruits do, a cultivated taste, and therefore if imported here would not find a market. Even those which do come here lose a great deal of their flavor from the fact that they are cut green so as to prevent their decay during transportation, and, of course, they do not taste as well as they do in the place where they grow. Of the banana, for instance, we have about twenty varieties, and some of them, the richest in my opinion, grow about twelve to fifteen inches in length and from two to three inches in diameter.

The advantage of tropical fruits growing in their proper zone and climate is immense, as the expense of planting and cultivating them outside of their proper limits is very great and there is always danger of their destruction. A recent cyclone, which lowered considerably the temperature in Florida, destroyed in one day, I understand, about 12,000,000 orange trees, thus causing the ruin of thousands of men engaged in that large industry, while the orange region in Mexico is entirely free from frosts and consequently from such dangers.

Among the tropical products of superior character that we raise in the hot zone I should mention tobacco, which in General Grant's estimation was superior to the Havana article. The natural conditions of soil and temperature are the same both in Cuba and Mexico, but we had not the superior experience of the Cubans in curing the leaf until the first insurrection broke out in Cuba, in 1868, when a great many Cubans went to Mexico to plant tobacco. As the land has been cultivated in Cuba with tobacco for nearly four hundred years, and as tobacco is a very exhausting crop, it has become indispensable to manure the land with guano; while in Mexico we have virgin land, and tobacco being a comparatively new industry, no guano needs to be used. General Grant, whom I considered a competent judge, detected the taste of guano in the Havana cigars, from which ours are free, and he therefore preferred to smoke ours.

In Cuba the exhausted soil cannot produce all the leaves that are required for the world's supply of Havana cigars, and the want can only be filled through the use of Mexican leaf tobacco. The Marquis de Cabañas sent to Sumatra a quantity of seed when it became obvious that the soil of the tobacco region of Cuba was fast being worn out. He sent seed also to Java and to the United States, but it was found that it was impossible to raise tobacco of Havana quality anywhere but in Mexico. That raised in Java from Havana seed was very coarse and rank, replete with nicotine and meconic acid, and devoid of those delicate essential oils that give the Havana and Mexican tobacco such an aroma.

The whole Central Plateau abounds in many species of cactus, which are used for several purposes. In the eastern portion of the Plateau, that is, from the City of Mexico towards Vera Cruz, in the region called the Plain of Apan, the cactus yields a large amount of a white juice, similar in appearance to milk, which when fermented is used as a tonic, and is an intoxicating beverage. The amount of alcohol it contains is small—about seven per cent., I believe—but imbibed in large quantities it is quite intoxicating. The use of this beverage, called pulque, has become very extensive in Mexico, and it must have very fine qualities both as a tonic and a nutritive, as many live on nothing but corn and pulque. In the mining districts, where a great deal of nervous force is expended, working in a high temperature and under very unhealthy atmospheric conditions, this drink is almost indispensable, and I imagine when a way is discovered to keep it for some time, and its medicinal qualities become better known, it will be exported in considerable quantities and used by foreign countries. Out of the cactus of other districts a drink is made called mescal, which has some remarkable therapeutic qualities, the most celebrated being made in a district of the State of Jalisco called Tequilla, from which it takes its name; and in the very dry and stony regions of Yucatan another species of cactus grows, which seems to derive its food wholly from the atmosphere. yielding a very good fibre, much like manilla, which we now export in large quantities, particularly to New York. All the cacti are a first-class fibre as raw material, either for paper or cordage—some of it being rather coarse, like the henequen from Yucatan, and more of it almost as fine and glossy as silk, like pita.

FAUNA.

The present Mexican fauna belongs, like its flora, to the North American zone, so far as regards the plateau regions, and to the Antilles in respect to the coast lands round the Gulf, while that of the Pacific seaboard is intermediate between the Californian and South American. In the general aspect of its terrestrial animals, Mexico is connected more with the United States, whereas in its marine forms, the reverse movement has taken place. Thus the prevailing species in the Gulf of Mexico as far as Tamaulipas and Texas, and the Pacific Coast northwards to Sonora and Lower California, have migrated from South America. The species in the two oceanic basins differ almost completely; and despite the proximity of the Pacific and Atlantic shores, their shells are quite distinct.

The fauna includes three species of large felidæ, the puma or American lion, jaguar, and ocelot; among the smaller is the wildcat. Wolves are common in the northern states, and also the coyotl or coyote; besides which there are bears, wild boars and bisons. A species of sloth is found in the southern forests, with five varieties of monkeys. Of the other wild animals the principal are hares, rabbits, squirrels, two or three kinds of deer, beavers, moles, martens, and otters.

All the domestic animals introduced by the early Spanish settlers have multiplied prodigiously. The horses, though small, retain the spirit and graceful form of the Andalusian or Arabian stock, from which they mainly sprang.

The waters of the estuaries and coast streams teem with fishes, all the numerous varieties of which differ on the two oceanic slopes, but still present a certain analogy in their general distribution. Turtles are taken in considerable numbers on the coast, and the "carey" or turtle-shell of Yucatan and Guerrero is the object of a trade valued at $20,000 yearly.

The ophidians are represented by a few boas in the southern forests, and several species of snakes, some extremely venomous, as the rattle and coral snakes. The largest lizard is the iguana, whose flesh is by some of the natives used as food. Noxious insects infest the hot regions in myriads; alacranes or scorpions, in two different varieties, are everywhere feared, and many children are every year killed by their sting in the city of Durango. Scolopendras, gigantic spiders, tarantulas and mosquitoes abound.

Bees are numerous and their wax is an article of export, and the silk-worm, though comparatively neglected, yields an annual profit of $40,000. The birds of prey are eagles, hawks, and zopilotes or turkey buzzards, the scavengers of the coast towns, with three or four species of owls. Domestic fowl are extremely abundant. The parrots, humming-birds, trogons, and so forth, vie in richness of plumage with those of Brazil, and the Mexican songsters, the prince of which is the zenzontle or mocking-bird, are unequalled by those of any other country.

Of all the Mexican fauna, two only have been domesticated: the huahulotl (*Meleagris Mexicana*), which is a species of duck, and the turkey, introduced into Europe by the Spaniards from the West Indies, hence by the French called "coq d'Inde." The techichi, an edible dumb dog, was soon exterminated when taxed by the Spanish authorities. The other farmyard animals have all been introduced into Mexico by the conquerors.

In the Gulf of California, and especially near Paz, and the neighboring archipelagoes, extensive beds of pearl oysters are fished. Some other islands in the same gulf are frequented by myriads of various species of aquatic birds, and have already yielded many hundred cargoes of guano.

It is noteworthy that the Pacific Islands, lying at some distance from the coast, have all a fauna different from that of the mainland. Thus the little Tres Marias group, about six hundred miles off the coast of Jalisco, has a special species of humming-bird. The Revilla-Gigedo Archipelago also forms a separate zoölogical zone, and the Island of Guadalupe, one hundred and fifty miles distant from Lower California, has eleven species of land birds, every one of which differs from the corresponding species on the adjacent continent.

ETHNOLOGY.

Mexico is inhabited by descendants of the conquerors of Mexico and other European races, by native Indians found there during the Spanish conquest, and by a mixture of the two. There are so few inhabitants of African descent that it is hardly worth while to speak of them. The proportion of this population is about as follows: of European descent 19 per cent.; Native Indians, 43 per cent.; mixed races, 38 per cent.

The native Indians found by the Spaniards belong to several nations and tribes, having different features and entirely distinct languages. The principal of these tribes are the following, some of which are now extinct:

Otomi,
Chichimec,
Huaxtec,
Totonac,
Mixtec,
Zapotec,
Mahuas,
Toltec,
Olmecs,
Xicalancs,
Tula,
Apache,
Irritilas,
Tamaulipecs,
Zacotec,
Huastec,
Zoqué,
Opata,
Guaicuri,
Yaqui,
Mayo,
Seri,
Tarahumara,
Tepehuan,
Sabaibos,
Acaxee,
Xixime,
Concho,
Manosprietas,
Comanche,
Cuachichils,
Tarascos,
Mixé.

These tribes have been classified in the following families:

Mexicana Family;
Sonorense Opata-Pima Family;
Guaicura y Cochimi Laimon Family;
Mixteco-Zapoteca Family;
Matlalzinga ó Pirinda Family;
Maya-Quiche Family;

Seri Family;
Tarasco Family;
Zoque-Mixe Family;
Totonaca Family;
Chontal Family;
Huave Family;
Apache Family;
Othomí Family.

There is a great deal of similarity between the Mexican Indians and the Malay Asiatic races — especially the Japanese branch, which gives foundation to the idea that the aborigines of Mexico originally came from Asia or *vice versa.* Their very black hair and eyes, their brown or yellow color, their small stature and the slight obliquity of their eyes, are common features to the Mexican Indians and the Japanese. When I first came to Washington, at the end of 1859, not having been out of Mexico before, I had very vivid recollections of the Mexican Indians, with whom I had been associated considerably; and shortly afterwards the first Japanese Embassy came to this country and was received in a very solemn manner by Mr. Buchanan, then President of the United States. The Embassy consisted of about forty persons altogether, between ministers, secretaries, interpreters, servants, etc., and they were dressed in their national gala costumes, not having yet adopted the European one. The Diplomatic Corps having been invited to the reception, I attended as a member of the same, and I was very much struck with the great similarity which I found between the Japanese members of the Embassy and the Mexican Indians, whom I had just left. It seemed to me that had I collected at random forty Mexican Indians and dressed them in the same gorgeous costumes that the Japanese wore, nobody would have detected the difference.

Some of the Indian languages seem to me to resemble strongly the Oriental ones, though of course in a very rough manner, as I do not know any of these languages, having heard only the Chinese, Japanese and Korean; but I am sure that if any educated and intelligent Chinese should go to Mexico and spend some time among the Indians, he would find traces in the language which would contribute greatly to clear up this problem. Mr. Tateno, a former Japanese Minister, who visited Mexico, found during his short stay in that country several words used in Japan.

The Indians of the different tribes do not generally mix with one another, but intermarry among themselves, and this fact contributes largely to their physical decay, and it makes very difficult, at least for some time to come, the complete assimilation of all the Mexican population.

LANGUAGES.

About 150 different Indian languages are known to have been spoken by the Mexican Indians. The Spanish monks who went to the country with the conquerors and immediately afterwards compiled grammars and even dictionaries of some of these languages; but the Indians falling into a semi-barbarous state after the conquest, having lost their civilization and literature, their languages have either disappeared completely or become very primitive, and it has been ascertained that some of them have become entirely extinct.

The Spanish is, of course, the language of the country and most of the Indians speak it, although very imperfectly and incorrectly; a small portion of them only speaking no language but their own.

The chief languages spoken in Mexico proper, excluding Chiapas and Yucatan, are as follows:

Nahuatl or Mexican (Aztec) with Acaxee, Sabaibo, Xixime, Cochimi, Concho and other members of the same family.
Seri, Upanguaima and Guaima.
Papago, Opata, Yaqui, Mayo, Tarahumara, Tepehuan, Cora, etc.
Apache or Yavipai, Navajo, Mescalero, Llanero, Lipan, etc.
Otomi or Hia-hiu, Pame, Mazahua, etc.
Huaxtec, Totonac.
Tarascan, Matlaltzincan.
Mixtec, Zapotec, Mixé, Zoqué, Chinantec.

POPULATION.

The upper lands being the healthiest, most of the population in Mexico is settled on the Central Plateau; and a comparatively small portion of it lives in the Temperate Zone, while the Torrid Zone is very thinly populated. I imagine at a rough calculation, that about 75 per cent. of the population make their abode in the cold zone, from 15 to 18 in the temperate zone and from 5 to 7 per cent. in the torrid zone.

The population in Mexico appears from our last official census, taken in 1895, to be 12,570,195; but from my personal knowledge of the country I feel perfectly sure that it is not less than 15,000,000. It is very difficult to take a correct census in Mexico, because there is not the proper machinery in operation working for that purpose, and especially because a great many districts are inhabited by Indians, who are very much afraid that if they inscribe themselves in the census they will be taxed or drafted into the military service, and they avoid for that reason their inscription.

A great many of our inhabitants live in such remote districts that they are practically out of communication with other portions of the country, and in fact are almost isolated; and this causes still another difficulty in taking a correct census. These people generally raise everything they need for their living and for their clothing also. They raise their own food and domestic animals, and wear either cotton or woollen clothes, which the women manufacture. Some are entirely isolated. The configuration of the country, making transportation very expensive, has caused this isolation, and this explains why some agricultural products, which are very cheap in other countries, are very dear in certain districts of Mexico, as the prices can there be easily controlled, there being no possibility of competition. While sugar, for instance, cost 25 cents per pound in some districts, it could be had in others for one cent. This fact shows also that a year of good crops was often a real misfortune to these districts.

The official census to which I have referred gives the following results:

AREA AND POPULATION OF THE UNITED MEXICAN STATES.

	STATES.	AREA IN SQUARE MILES.	POPULATION.	CAPITAL.	POPULATION.
Northern States bordering on the U. S.	Tamaulipas	32,585	204,206	Ciudad Victoria	14,575
	Nuevo Leon	24,324	309,607	Monterey	56,855
	Coahuila	62,376	235,638	Saltillo	19,654
	Chihuahua	87,820	266,831	Chihuahua	18,521
	Sonora	76,922	191,281	Hermosillo	8,376
Southern States bordering on Guatemala.	Yucatan	35,214	297,507	Mérida	36,720
	Campeche	18,091	90,458	Campeche	16,631
	Tabasco	10,075	134,794	S. Juan Bautista	27,036
	Chiapas	27,230	313,678	Tuxtla Gutierrez	7,882
Atlantic.	Vera Cruz	29,210	855,975	Jalapa	18,173
Pacific.	Oaxaca	35,392	882,529	Oaxaca	32,641
	Guerrero	25,003	417,621	Chilpancingo	6,204
	Michoacan	22,881	889,795	Morelia	32,287
	Colima	2,273	55,677	Colima	19,305
	Jalisco	31,855	1,107,863	Guadalajara	83,870
	Sinaloa	33,681	256,414	Culiacan	14,205
	Over	554,932	6,509,874		

	STATES.	AREA IN SQUARE MILES.	POPULATION.	CAPITAL.	POPULATION.
		554,932	6,509,874		
Central.	Aguas Calientes...	2,951	103,645	Aguas Calientes........	31,619
	Durango..........	38,020	294,366	Durango...............	42,165
	Guanajuato.......	11,374	1,047,238	Guanajuato............	39,337
	Hidalgo..........	8,920	548,039	Pachuca...............	52,189
	Morelos..........	2,774	159,800	Cuernavaca...........	8,554
	Mexico...........	9,250	838,737	Toluca................	23,648
	Puebla...........	12,207	979,723	Puebla................	91,917
	Querétaro........	3,558	227,233	Querétaro.............	32,790
	Tlaxcala.........	1,595	166,803	Tlaxcala..............	2,874
	San Luis Potosí...	25,323	570,814	San Luis Potosí........	69,676
	Zacatecas.........	24,764	452,720	Zacatecas.............	40,026
Territories.	Tepic............	11,279	144,308	Tepic.................	16,226
	Lower California..	58,345	42,287	La Paz and............	4,737
				Ensenada de Todos Santos	1,259
	Federal District...	463	484,608	City of Mexico.........	339,935
	Islands........	1,471			
	Totals......	..767,226	12,570,195		

The States of Tamaulipas, Tabasco, Campeche and Yucatan border on the Gulf of Mexico, the latter being washed on one side by the Caribbean Sea, and the States of Sonora and Chiapas and the Territory of Lower California border on the Pacific.

It has been matter of wonder to me why the population of Mexico has not increased as rapidly as that of other countries. A large portion of it is composed of Indians, who live a very abstemious and plain life, marry while very young and generally have a family of several children; but they are, of course, subject to epidemics. While the mortality is large among the children, for want of proper care and nutrition, the race on the whole is sturdy and is hardly subject to disease. The losses caused by our civil wars could not at all explain the slow increase of our population, and the only way in which I can account for it is that they are not so well prepared as are the people of the United States and other more civilized countries to bear the discomforts of life and of climate, and that therefore they cannot bring up all the children born in the family, among whom there is annually great mortality.

RELIGION.

All Mexicans are born in the Catholic Church. Some of them, like the Indians, do not know much about religion and keep their old idolatry, having changed only their idols, that is, replaced their old deities with the images of the Saints of the Catholic Church. The Spaniards were very active in making the natives adopt the

Catholic religion, and although they succeeded wonderfully, it was a task very difficult to fully accomplish in the three centuries of the Spanish domination in Mexico. American Protestant missionaries have tried to make some converts in Mexico, but they have succeeded very poorly. They have established chapels which, in size and architecture, cannot be compared with the smallest Catholic Church. The number of Catholic churches and chapels in the country is 8,763, while the number of places of Protestant worship is only 63.

In February, 1888, an Evangelical Assembly, representing the various Protestant denominations and Evangelical Societies conducting missionary operations in the Republic of Mexico, was held in the City of Mexico. They represented that notwithstanding the difficulties of language, climate and other things they had to contend with, they found that they had over 600 congregations; 192 foreign and 585 native workers; over 7,000 in the day schools and about 10,000 in the Sunday schools; 18,000 communicants, and a Protestant community of over 60,000 souls. Ten small publishing houses are turning out millions of pages each year, and their church property is valued at nearly a million and a quarter dollars (silver).

EDUCATION.

Notwithstanding the efforts made to promote public education, the total number of public schools established in the country and maintained at the public expense is 8,675, attended by 435,953 pupils of both sexes, and kept at a public expense of $5,455,549.60 yearly. The number of schools in the country for professional technical education is 136, attended by 16,809 pupils of both sexes. The schools supported by corporations or persons, including parochial schools, number 3,129, with 78,291 pupils of both sexes.

The Spanish Government did not care to educate the Indians, fearing that, once educated, they might desire to sever their political connection with the mother country, and the Mexican Government has been too much disturbed since its independence to promote their education earnestly. I consider that one of the first duties of Mexico is to educate the large number of Indians which we have, and when that is accomplished the whole condition of the country will change, as it will be able in a few years to increase by several millions its productive and consuming population.

In May of this year an act was passed by the Mexican Congress making primary education obligatory on all the inhabitants of the Federal District and Territories, and placing public education under the control of the Federal Government.

The total number of newspapers published in the country is 258, showing that the press has not attained there the great development that it has in this country.

THE VALLEY AND CITY OF MEXICO.

The Valley of Mexico is one of the finest spots in the world. Surrounded by high mountains—almost at the foot of the two highest in the country, Popocatepetl and Ixtaccihuatl—with a very rare and clear atmosphere and a beautiful blue sky, especially after a rain, it is really a centre of magnificent scenery. The rareness of the atmosphere makes distant objects appear to be very near, and when looking from the City of Mexico at the mountains which surround the Valley, one imagines that they are at the end of the City, while some of them are at a distance of forty miles. The view of the Valley from Chapultepec Hill, which is about 150 feet high and distant about three miles from the City, towards its western extremity, where our military school now is and where the President has made his summer residence, is one of the most beautiful with which this earth is endowed. I have seen the Bosporus, Constantinople, the Bay of Naples and other spots in the world which are supposed to be most remarkable for their natural beauty, but I think the view of the Valley of Mexico from Chapultepec can be advantageously compared with them, if it does not excel them all.

Seven lakes are within the limits of the Valley, and as they have no natural outlet the City of Mexico has been deprived for some time of a proper drainage and its health has been affected very materially thereby. But the colossal undertaking of making an artificial outlet is now practically finished. In an article which I published in the *Engineering Magazine* in January, 1895, I dwelt especially on the work done during four centuries to accomplish that great end.

The City of Mexico, located in the western end of the Valley, at an altitude of 7,472 feet above the sea level, in 19° 26′ north latitude and 99° 07′ 53″.4 Longitude West of Greenwich, covering about twenty square miles, is one of the most ancient cities of this Continent, and during the Spanish rule it was the largest and most important city of Spanish Colonial America. It is a city of 340,000 inhabitants, with fine buildings, the magnificence of which can be understood when it is considered that the Cathedral took nearly one hundred years to build, and that there were sometimes 10,000 men working at it. It is 426 feet long by 203 feet wide, its towers rising to the height of 218 feet.

It is situated on one side of the Central Square (plaza) of the City of Mexico and replaces the church erected by Cortes, on the spot where stood the "teocalli," or temple of the war god, ever reeking with the blood of human victims.

The City of Mexico is not only the capital of the country, but the real head of the Republic; and the aim of all other Mexican cities is to follow in the footsteps and imitate as much as possible the City of Mexico, which to them is a *beau idéal* and a real paradise.

The mean temperature of the City of Mexico in the shade is 60° 26′ Fahrenheit, the maximum being 84° 92′ and the minimum 32° 90′. The mean temperature in the open air is 60° 80′, the maximum being 98° 60′ and the minimum 22° 64′. The total amount of rainfall in 1895 was 19.694 inches; the greatest rainfall in twenty-four hours was 1.260 inches. The prevailing wind is the North; the velocity of the wind per hour is 2.23 miles.

The prevailing wind in the Valley of Mexico is northwest and north-northwest, which blew 250 times during the year 1883; while the southern winds, which are very dry, are rare, as they only blew 51 times in that year; but at the same time they have greater velocity than the others, and the greatest relative velocity of the winds is 3.0. The west and northwest winds are very damp.

MINING.

Mexico is, perhaps, the richest mining country in the world, and the production of silver—notwithstanding the imperfect methods and other drawbacks with which it has contended—represents over one-third of the product of the world, according to recent statistics. Almost all the mountains of Mexico are of a metalliferous character, but those which seem richest in mining deposits are the western Cordillera, extending from the State of Oaxaca to Sonora, a distance of about 1,600 miles from northwest to southeast.

The central group of mines in the three mineral districts of Guanajuato, Zacatecas and Catorce, in the State of San Luis Potosí, which have yielded more than half of all the silver hitherto found in Mexico, lies between 21° and 24° 30′ N., within an area of about 13,000 square miles. Here the Veta Madre lode of Guanajuato alone produced $252,000,000 between 1556 and 1803. Gold occurs chiefly, not on the plateau in association with silver, but on the slopes facing the Pacific and apparently in greatest abundance in Sonora, near the auriferous region of Lower California. The production would have been larger if an improved process of reducing the metals had been used, but during the whole colonial period and up to the present time, we have used the patio system, which consists in grinding the ore, stirring until it is reduced to a fine dust and mixing it then with salt and copper amalgam; after the paste dries somewhat, salt is added in proportion to the amount of silver supposed to be in the ore; the material is then mixed with shovels and trodden by mules, and, after a day or two, another mixture of copper, vitriol and salt is added; after that it is mixed and trodden again; then quicksilver is finally added, and then more mixing and treading. This process is repeated from five to fifteen times until the silver and quicksilver unite to form an amalgam, which is gathered into bags, and that requires about forty days. Most of the quicksilver is squeezed out and the rest is evaporated and run off into tubs. This method saves fifty or sixty per cent. of rich ore. This process, besides being very long, is rather imperfect, as it leaves some silver in the ore, and only rich ores could be treated by it, but it was on the whole the easiest and cheapest. Some of these mines were worked until finally they became so deep that, with the methods then used, as buckets were employed instead of pumps, and steam had not been applied as power, it was impossible to drain them. Naturally, in a deep mine the water flows in from springs, and the deeper a mine becomes the more water it has. These mines were worked until it was seen that it was not possible to drain them, and then they were abandoned, even though they were rich in metals. During our war of independence almost all the mines were abandoned for want of guarantee to life and property, and the mining industry, therefore, declined considerably; but recently the old mines have been worked again and the production of silver has increased very considerably.

We had thirteen mints in the country to coin the silver extracted from our mines, which, in the precarious condition of the Mexican treasury, were sometimes rented to private parties who paid a sum large at that time, although it was a trifle in comparison with their profits, as they collected a duty of nearly 4½ per cent. upon the amount of bullion coined, and the laws required that only coined silver could be exported. But now that silver can be transported easily from the mine to the mint, since a railway system has been built, the mints have been reduced to four—one in the City of Mexico, which is the principal one; one in Guanajuato, one in Zacatecas and one in Culiacan, the capital of Sinaloa. Some years ago, and when the Mexican mines only yielded about $20,000,000 a year, I predicted that their yield would reach $100,000,000, and that prediction is apparently soon to be verified, as the present product exceeds $60,000,000.

When Li Hung Chang, the Chinese Viceroy, was in Washington, in August of this year, he inquired of me about the production of the Mexican mines, and I, trying to be conservative, informed him that they produced about $50,000,000 a year. He then inquired how long they would continue yielding that amount. I answered that it was uncertain, but that, judging from present appearances, it could safely be said that it might be for one hundred years. This seemed incredible to him, and he said that as I had been so long absent from Mexico—for he had previously asked me how long I had been in this country—I could not know the real wealth and abundance of our mines, and he was very positive that I had made a mistake. He assured me that the silver mines in China yielded occasionally something, but soon were exhausted and it was impossible to get any silver out of them, and judging the Mexican silver mines from those he had seen at home, he was, of course, incredulous as to their yield.

Our production of gold has so far been comparatively small, because the mining and reduction of gold is more difficult and expensive than the same operations in silver, and our gold production has really been the amount of gold which has been found in our silver. For many years, when the amount was small, it was not separated, and for that reason old Mexican dollars have in China greater value than newly-coined ones; but recent improvements have made it easy and cheap to make the separation of the two metals. Now that gold has risen so much in value, its mining is beginning to be developed in Mexico on a comparatively large scale, and I have no doubt that before long, Mexico will be one of the largest gold producers of the world.

The total coinage of gold and silver in Mexico, according to official statistics of the Mexican Government, is the following:

	GOLD.	SILVER.
Colonial Period from 1537 to 1821..	$68,778,411	$2,082,260,657
Period of Independence to June 30, 1896	56,597,274	1,318,697,753
	$125,375,685	$3,400,958,410

According to the data embraced in the report of the Director of the Mint (page 314) on the production of precious metals in the United States during the calendar year 1894, the total coinage of the world from 1493 to 1894 is $10,129,129,000, the Mexican coinage being over one-third of the whole.

The above statistical information embraces only the silver coined, and it does not take into consideration the silver used in the arts, which was of a considerable amount, as almost every well-to-do Mexican had forks, spoons, plates and other articles of table-ware and household articles of solid silver. It does not embrace either such silver as was smuggled in bullion, which, considering the large extent of the Mexican sea coast, its scanty population and the demoralization of trade during our civil wars, represents a very large amount. It can, therefore, be safely stated that the production of silver in Mexico, not coined, represents at least from one-third to one-fourth of the amount coined.

Therefore, the production of silver by Mexico may be safely estimated at from $4,000,000,000 to $5,000,000,000, which is nearly one-half of the whole product of the world.

It may be interesting to state the amount of silver exported and coined in Mexican mints from 1874 to 1896, which is the following:

	EXPORTED.	COINED.
1874–75	$16,038,215	$19,386,958
1875–76	....	19,454,054
1876–77	....	21,415,128
1877–78	20,853,074	22,084,203
1878–79	19,339,151	22,162,988
1879–80	20,307,563	24,018,529
1880–81	17,774,910	24,617,395
1881–82	15,700,704	25,146,260
1882–83	28,441,212	24,083,922
1883–84	32,242,770	25,377,379
1884–85	32,770,900	25,840,728
1885–86	29,160,835	26,991,805
1886–87	32,642,785	26,844,031
1887–88	30,286,247	25,862,977
1888–89	37,982,948	26,031,223
1889–90	37,912,848	24,328,326
1890–91	35,259,131	24,237,449
1891–92	46,272,391	25,527,018
1892–93	44,303,593	27,169,876
1893–94	36,012,950	30,185,612
1894–95	36,716,870	27,628,981
1895–96	46,722,823	22,634,788
	$616,741,920	$541,029,630

This table embraces the silver exported and coined in twenty-one years, from 1874–75 to 1895–96, excepting the years 1875–77, as I do not have the figures of the silver exported during the same, and the difference between the two amounts for these years is $75,712,290, showing the large proportion of silver which was not coined.

Under the Spanish laws, all silver paid a duty; and as most of it was coined, that duty was levied on coinage, and the exportation of bullion was prohibited; but of course a great deal was smuggled, both during the Spanish rule and still more when Mexico was opened to foreign trade after our Independence. When I occupied for the first time the Treasury Department of Mexico in 1868, it seemed to me an outrage against the mining industry of the country to require the miners—especially those who were far removed from the mints—to take their bullion to the mints, at a heavy expense and risk, coin it there and take it back to the mines, and from there to the ports to be exported to London, where it was often again turned into bullion; and as the contracts made with the lessees of the mints did not allow the free exportation of bullion, I proposed and succeeded in having enacted a law for the purpose of allowing bullion to be exported, provided that it paid the coinage duty at the respective custom-houses for the benefit of the latter's lessees; and this condition of things, extraordinary as it may seem, was a great relief to the silver producers, and continued until the Mexican Government could recover all the mints and be free to legislate on the subject, which it was able to do partially during my last incumbency of the Treasury Department; and they have all since been recovered.

RAILWAYS.

For many years the government tried very assiduously to have railroads constructed in Mexico, but the broken surface of the country made the building of these roads very expensive. Until 1873 the means of internal locomotion were mainly limited to the wretched bridle paths from the Central Plateau over the sierras and terrace lands down to a few points on both coasts, and to twenty-four regular lines of diligences under one management.

In 1854 the first railroad was finished between the City of Mexico and Gaudalupe, about three miles in length, with a small branch from Vera Cruz to Tejeria towards the City of Mexico, about 12 miles in length, these being the only railways that were built up to 1861. During the French Intervention the French army prolonged the Tejeria road to Paso del Macho, about 35 miles to the foot of the mountain, so as to be able to transport their army with the shortest delay possible out of the yellow fever zone, and an English Company which had a grant for a road from the City of Mexico to Vera Cruz, which was supposed at the time to be the only one that could be built in Mexico, extended the Guadalupe road to Puebla.

No construction of consequence was done immediately after the French Intervention, because the country was generally in a disturbed condition, although several efforts were made in that direction by President Juarez. The Vera Cruz road was finished 1873, under Señor Lerdo de Tejada's Presidency, and when General Diaz became President in 1876 he earnestly promoted railroad building; and we now have two trunk lines connecting the City of Mexico with the United States—the Mexican Central to El Paso, Texas, with a branch from San Luis Potosí to the port of Tampico; and the Mexican National to Laredo, Texas. Another trunk line from Eagle Pass to Torreon and Durango has also been built by Mr. C. P. Huntington and his associates. There is besides a line from Nogales to Guaymas, built and owned by the Atchison, Topeka and Santa Fé Co., and these four lines connect us with the main systems of the United States, our lines being in fact extensions of the United States railway system. We have now two lines from the City of Mexico to Vera Cruz. All of our roads, excepting the one built by Mr. Huntington, have had large subsidies paid by the Mexican Government, and in some cases, as in the Vera Cruz Railroad, the subsidy paid was $560,000 per English mile. The amount of subsidies forms a large portion of our debt, as will be shown hereafter.

The Tehuantepec railway running from Coatzacoalcos, on the Gulf of Mexico, to Salina Cruz, on the Pacific, about 130 miles in length, has been built at great expense and sacrifice by the Mexican Government. I published in the *Engineering Magazine* for March, 1894, an article relating the different efforts made by the Mexican Government to have that road built, and the advantages that we expected from it as a highway of trade between the Atlantic and the Pacific.' The Mexican Government has recently made a contract with a London firm, for the purpose of building good harbors at both ends of the road, and when that is accomplished we expect that a great deal of eastern trade will pass through Tehuantepec.

With the exception of the Tehuantepec road we have not any running from the Atlantic to the Pacific, although several are in process of construction. The descent of the mountains is on the Pacific slope a great deal more difficult than on the Gulf coast, and this explains why none of the roads have so far been able to reach the Pacific Ocean.

Our railway system goes towards Guatemala as far as the City of Oaxaca, and there we are only about 500 miles away from our frontier with Guatemala. Otherwise, our system reaches the principal cities and commercial and mining centres of the country.

The following table shows the annual building and earnings of railroads in Mexico:

ANNUAL BUILDING AND EARNINGS OF RAILWAYS IN MEXICO.

	KILOMETRES OF ROAD BUILT.		ANNUAL EARNINGS.
	EACH YEAR.	TOTAL.	
1873	....	578.248	$2,097,104.55
1874	8.680	586.928	2,665,496.18
1875	75.780	672.708	2,799,696.13
1876	3.645	666.353	2,563,241.00
1877	6.018	672.371	3,213,434.17
1878	65.577	737.948	3,400,799.89
1879	147.979	885.927	3,828,718.65
1880	193.650	1,079.577	4,504,135.39
1881	691.791	1,771.368	5,679,193 37
1882	1,937.843	3,709.211	9,883,719.51
1883	1,727.479	5,436.690	12,102,583.34
1884	454.677	5,891.367	11,089,136.39
1885	118.470	6,009.837	10,656,551.42
1886	79.018	6,088.855	11,373,667.63
1887	519.954	6,608.809	13,310,218.79
1888	1,217.506	7,826.351	16,121,267.79
1889	628.692	8,455.007	18,788,142.29
1890	1,262.926	9,717.933	20,919,287.14
1891	796.651	10,514.584	23,762,172.87
1892	566.765	11,081.349	25,363,922.29
1893	23.865	11,057.484	25,359,244.06
1894	191.206	11,248.690	....

The total mileage of railway in 1895 was 6,989½ English miles. In 1893 we had 37,880 English miles of telegraph lines, of which 24,840 belonged to the Federal Government, the remainder belonging in about equal parts to the States, private companies and railways.

The following table contains a list of all the railroads, exclusive of the tramways, built in Mexico up to the 31st of December, 1896, prepared by the Department of Communications of the United Mexican States, which I think of interest to insert here:

OFFICIAL STATEMENT MADE BY THE DEPARTMENT OF COMMUNICATIONS OF THE MEXICAN GOVERNMENT OF THE RAILROAD MILEAGE IN OPERATION ON OCTOBER 31, 1890.

(1) The initials at the beginning of each line of this table stand for the gauge of the railroads: S. for standard, N. for narrow, and B. for both.

NAME.	DATE OF CONCESSION.	LENGTH.	FROM AND TO.
(1) S. Mexican.	Nov. 27, 1867	292.50	Mexico to Veracruz and Apizaco to Puebla.
S. Mérida to Progreso.	Jan. 17, 1874	22.65	Mérida to Progreso.
N. Hidalgo.	Feb. 2, 1878	92.43	Tepa to Sototlan, Tepa to Pachuca and San Augustin to Tepa.
B. Veracruz to Alvarado.	Mar. 26, 1878	43.75	Veracruz to Medellin and Medellin to Alvarado.
N. Mérida to Peto.	Mar. 27, 1878	68.97	Merida to Ingenio de Sta. Maria.
N. Interoceanic from Acapulco to Veracruz.	Apr. 16, 1878	489.74	Mexico to Veracruz, Mexico to Puente Ixtla by Morelos and branches of Virreyes to Libres and San Nicolas.
N. Puebla to Isucar de Matamoros.	May 6, 1878	52.39	Los Arcos to Cholula, Cholula to Atlixco and Atlixco to Matamoros.
S. Mexican Western.	Aug. 16, 1880	38.48	Culiacan to Atlata.
S. Mexican Central.	Sept. 8, 1880	1,877.15	Mexico to Paso del Norte, Silao to Guanajuato, Irapuato to Guadalajara, Aguascalientes to Tampico, San Blas to Huaristemba and Guadalajara to Ameca.
N. Mexican National.	Sept. 13, 1880	1,056.16	Mexico to Laredo, Acambara to Platzcuaro, Matamoros to S. Miguel, Mexico to Salto, Circunvalacion, tramways from suburbs of Mexico called La Colonia to El Salto.
N. Mexican National Construction Company.	Sept. 13, 1880	88.30	Manzanillo to Colima and Zacatecas to Ojo Caliente.
S. Sonora.	Sept. 14, 1880	262.40	Guaymas to Nogales.
N. Mérida to Valladolid.	Dec. 15, 1880	67.53	Merida to Valladolid and Progreso to Conkal.
N. Tlalmanalco.	Feb. 3, 1881	16.56	Tlalmanalco to Chalco and Amecameca.
N. Mérida to Campeche.	Feb. 23, 1881	97.80	Mérida to Campeche, Campeche to Calkini and connecting line with the railroad from Mérida to Progreso.
N. Campeche to Lerma	Feb. 23, 1881	3.73	Campeche to Lerma.
S. Mexican International.	June 7, 1881	658.28	Porfirio Diaz City to Torreon and Durango, Sabinas to Hondo, Matamoros to Zaragoza, Hornos to San Pedro, branch from Velardena and Monclova to Cuatro Cienegas.
N. Nautla to San Marcos.	June 25, 1881	47.22	San Marcos toward Naútla and branch to Libren.
N. San Juan Bautista to Paso del Carrizal.	Sept. 17, 1881	3.57	S. Juan Bautista to Tamulte.

NAME.	DATE OF CONCESSION.	LENGTH.	FROM AND TO.
S. Chalchicomula.	Sept. 20, 1881	6.43	San Andres Chalchicomula.
S. Orizaba to Ingenio.	Sept. 22, 1881	4.69	Orizaba to Ingenio.
S. Santa Ana to Tlaxcala.	Dec. 11, 1882	5.28	Santa Ana to Tlaxcala.
N. Cardenas to the River Grijalva.	May 12, 1883	4.66	Cardenas to the River Grijalva.
N. Toluca to San Juan de las Huertas.	May 25, 1883	9.77	Toluca to San Juan de las Huertas.
N. Vanegas, Cedral, Matehuala and Rio Verde.	June 11, 1883	40.39	Vanegas to Cedral and branch to Potrero.
S. Tehuacan to Esperanza.	Nov. 28, 1883	31.07	Esperanza to Tehuacan.
S. Mérida to Izamal.	May 15, 1884	40.91	Mérida to Izamal.
S. Chihuahua and Hidalgo to the Sierra Madre.	Nov. 13, 1884	6.83	Chihuahua to the Sierra Madre and Jimenez to Balleza.
N. Southern Mexican.	Apr. 21, 1886	228.00	Puebla to Oaxaca.
S. Tonala to Textla and Frontera.	Dec. 16, 1886	31.07	Tonala to Kilomete.
S. Lower California.	May 25, 1887	16.78	San Quintin to the Colorado River.
S. Monterey to the Gulf.	Nov. 10, 1887	388.12	Monterey to Treviño and Monterey to Tampico.
N. Tecolutla to Espinal.	Dec. 10, 1887	13.04	Tecolutla to Espinal.
S. Córdova to Tuxtepec.	May 19, 1888	31.69	Córdova to Motzorongo.
S. Pachuca to Tampico.	June 5, 1888	6.21	Isolated Branch.
N. Maravatío to Cuernavaca.	Aug. 16, 1888	40.84	Maravatío towards Cuernavaca and branches to Agangueo to Trojes.
N. Northeastern of Mexico.	Aug. 28, 1888	31.12	Mexico to Tizayuca.
N. Salamanca to Jaral.	Aug. 30, 1888	21.75	Salamanca to Jaral.
N. Monte Alto.	Aug. 30, 1888	6.21	Tlalnepantla to Pedregal.
N. Veracruz to Boca del Rio.	Aug. 31, 1888	13.67	Veracruz to Boca del Rio.
S. National Tehuantepec.	Government Road.	192.38	Coatzacoalcas to Salina Cruz.
S. Ometusco to Pachuca.	May 25, 1889	28.40	Ometusco to Pachuca.
S. Puebla Industrial.	July 21, 1889	22.21	Puebla to Constancia, Cholula and Huejotzingo.
S. Tula to Pachuca.	Dec. 20, 1889	43.49	Tula to Pachuca.
S. Minero.	Mar. 20, 1890	80.94	Escalon to Sierra Mojada and branches.
S. México to Cuernavaca and the Pacific.	May 30, 1890	58.65	Mexico to Tres Marias and Puente de Ixtla to Mexcala.
N. Mixcalco to Santa Cruz.	June 13, 1890	2.77	Mixcalco to Santa Cruz.
N. Izucar of Matamoros to Acapulco.	Nov. 21, 1890	24.85	Matamoros towards Acapulco.
N. Toluca to Tenango.	Nov. 24, 1891	4.35	Toluca to Tenango.

NAME.	DATE OF CONCESSION.	LENGTH.	FROM AND TO.
N. Hacienda of Xavaleta to the San Rafael Paper Factory.	Mar. 24, 1892	2.49	Hacienda of Xavaleta to San Rafael Paper Mill.
S. Esperanza to Xuchil.	Nov. 29, 1892	15.84	Esperanza to Xuchil Station.
N. Guanajuato to Dolores, Hidalgo and San Luis de la Paz.	May 24, 1893	6.21	Rincon on the National Railroad to San Luis de la Paz.
S. Villa Lerdo to San Pedro de la Colonia.	June 3, 1893	15.84	Villa Lerdo to Sacramento.
N. Celaya to the farms of Roque and Plancarte.	June 2, 1893	9.07	Celaya to the farms of Roque and Plancarte.
N. From La Compañia to the Zoquiapan farm.	June 13, 1893	5.17	La Compañia to the Zoquiapan farm.
S. Cazadero to Solis.	May 24, 1893	18.64	Cazadero to point between the stations of Solis and Tepetongo.
S. Industrial Railroads.	Dec. 18, 1895	1.86	Mexico to Xochimilco.
	Total.......	(1) 6,891.30	

(1) This amount does not include the tramways.

POLITICAL ORGANIZATION.

Mexico was the largest and richest American colony of Spain, and for this reason it was called New Spain. The City of Mexico grew during the Spanish rule to be larger than Madrid, the capital of the Spanish Kingdom; and the population of the country was calculated in 1810, just before the independence movement began, at about 6,000,000 of inhabitants; while the public revenue of the whole colony amounted to the very large sum of $20,000,000 yearly, the only exports of the country being silver and gold, and commodities of great value in small volume and weight, like cochineal, vanilla, indigo, and a few others.

Mexico accomplished her independence in 1821, and since then has had two Federal constitutions, organizing it into a centralized Republic, and two ephemeral empires, one under Iturbide, lasting a few months, from 1822 to 1823; and the other under Maximilian, established by French intervention, lasting from 1864 to 1867.

Mexico is now organized under the Constitution of the 5th of February, 1857, with its several amendments, into a Federal Republic composed of twenty-seven States, two territories and a federal district, and the political organization is almost identical with the one prevailing in this country. The powers of the Federal Government are divided into three branches—Legislative, Executive and Judicial. The Legislative is composed of a House of Representatives and a Senate, the members of the House serving two years and the Senators four, the Senate being renewed by half every two years. Representatives are elected by the suffrage of all male adults, at the rate of one member for every 40,000 inhabitants. The qualifications requisite are to be twenty-five years of age and a resident of the State; and thirty years of age for Senators. The Executive is exercised by a President elected by the electors popularly chosen, who holds his office for four years, without any provision forbidding his re-election. He has a cabinet of seven members, to wit: Foreign Affairs, Interior, Justice, Fomento (Promotion of Public Improvements), Communications, Treasury, and War and Navy. There is no Vice-President elected, but the Secretary of State replaces the President in case of temporary sickness or absence, while in case of death or permanent inability, Congress elects a provisional president, who discharges the office until one is elected by the people.

The Federal Judiciary is composed of a Supreme Court, three District and thirty-two Circuit Courts.

The States are independent in their domestic affairs, and their governments are similarly divided into three branches—the Governor, Legislature, and the State Judiciary.

As we adopted the federal system rather to follow the example of the United States than to suit the conditions of Mexico, that system did not work with us so easily or satisfactorily as it does here, and the tendency is rather to centralization and to increase the power given by the Constitution to the Federal government. In an article that I published in the *North American Review* for January, 1896, entitled "The Philosophy of the Mexican Revolutions," I dwelt especially on the result of our having copied almost literally the political institutions of the United States, and gave a general idea of our political condition.

The tabular statement published above under the head of *Population* shows the number of States which form the Mexican Confederation, their area, population and capitals.

The army consists of: Infantry, 22,964; engineers, 766; artillery, 2,304; cavalry, 8,454; rural guards of police, 2,365; gendarmerie, 250; total, 37,103. There are over 3,000 officers. There is a fleet of two unarmored gun-vessels, each 450 tons and 600 horse-power, and armed with 20-pounders; one training ship of 1,221 tons, armed with four (4.72) guns, two of 57 m-m guns, and two 32 m-m guns, and three small gunboats.

REVENUES AND EXPENSES.

The financial question was for many years the leading and the most difficult one in Mexico, because the urgent needs of the Treasury specially on account of the disturbed condition of the country, made public expenses considerably exceed the revenue, and this condition did not allow of a thorough overhauling and settlement of the finances, nor did it contribute to establish the credit of the Government; but peace prevailing since 1877, a great improvement has taken place in the financial condition of Mexico; the revenue has increased considerably, and it has finally reached an amount amply sufficient to pay all our expenses. During the last fiscal year, for the first time in the history of Mexico since its independence, there was a *surplus* which amounted to $6,000,000. The obnoxious taxes which we inherited from the Spanish, called "alcabalas," or interstate duties, on domestic and foreign commerce, were a great drawback to internal trade, and were finally abolished on July 1st, 1896; and the country is now in a condition when radical reforms can be introduced without serious disturbances.

The subjoined tables give the amount of the Federal revenue and expenses of Mexico since her independence up to the last fiscal year as far as I have been able to collect them. When Mexico was under a centralized Republic, as from 1834 to 1847 and from 1853 to 1855, the receipts and expenses embraced the Provincial or State revenues and expenses.

STATEMENT OF THE REVENUE AND EXPENSES OF THE FEDERAL GOVERNMENT OF MEXICO FROM 1828 TO 1896.

	REVENUE.	EXPENSES.
1808, Colonial period	$20,075,362.25	....
1822	9,328,740.00	$13,455,377.00
1823	5,249,858.96	3,030,878.50
1824	15,254,601.03	15,165,876.05
1825 to Sept. 1st	7,903,163.42	13,110,187.24
Sept. 1, 1825, to June 30, 1826	14,770,733.30	13,112,200.65
1826–27	17,017,016.59	16,364,218.36
1827–28	13,644.974.69	12,982,092.86
1828–29	14,593,307.69	14,016,978.27
1829–30	14,103,773.28	13,728,491.39
1830–31	18,392,134.96	17,601,289.67
1831–32	17,582,929.15	16,937,384.67
1832–33	20,563,360.77	22,392,607.90
1833–34	21,124,216.81	19,934,490.42
1834-35	18,353,283.00	12,724,686.62
1835–36	26,382,303.90	17,766,262.81
1836–37	17,327,706.15	19,181,138.95
1837–38	25,018,121.77	26,588,305.03

	REVENUE.	EXPENSES.
1839	$29,136,536.64	$27,318,729.73
1840	21,227,263.43	21,235,097.67
1841	23,995,766.52	22,997,220.18
1842	30,682,369.40	30,639,711.00
1843	34,138,581.72	34,035,277.13
1844	31,873,019.47	31,260,225.87
1845	24,159,050.04	19,584,812.91
1846	24,026,938.36	27,845,487.28
1847	26,154,222.84	31,251,467.91
1848 to June 30, 1849	25,726,737.23	19,742,876.48
1849–50	18,281,835.38	17,291,233.25
1850–51	14,955,535.73	14,477,369.06
1851–52	11,022,291.17	10,475,686.10
1852–53	10,044,298.40	16,287,532.90
1853–54	19,028,975.00	18,726,088.00
1854–55	26,259,970.45	23,396,074.75
1855–56	15,855,597.47	12,920,257.65
1856–57	16,035,609.81	12,977,265.90
1857–58	15,529,887.47	15,927,102.01
1858–59	14,737,763.76	16,005,536.45
1859–60	14,306,675.28	16,589,034.47
1860–61	12,863,500.00	12,750,500.00
1861–62	15,500,000.00	15,300,600.00
1862–63	17,600,000.00	17,595,690.00
1863–64	7,000,000.00	6,990,000.00
1864–65	5,950,000.00	5,945,000.00
1865–66	5,057,500.00	5,053,250.00
1866–67	8,092,000.00	8,085,200.00
1867–68	17,258,170.02	16,005,678.48
1868–69	17,117,746.45	16,862,024.12
1869–70	13,301,076.45	16,669,985.28
1870–71	14,539,301.90	21,318,505.16
1871–72	19,025,250.91	18,346,109.21
1872–73	21,944,440.63	20,689,345.80
1873–74	22,197,802.02	20,910,193.07
1874–75	22,839,921.90	18,242,894.31
1875–76	23,672,498.11	24,891,502.18
1876–77	16,866,938.03	25,839,255.93
1877–78	30,051,366.05	30,273,361.87
1878–79	19,772,638.13	21,748,902.78
1879–80	17,811,124 96	18,895,198.65
1880–81	21,124,037.53	23,128,218.60
1881–82	23,172,723.58	25,217,633.82
1882–83	30,466,093.74	27,011,509.06
1883–84	32,850,951.25	30,713,996.14
1884–85	28,284,927.95	25,825,433.83
1885–86	30,660,434.24	38,903,353.16
1886–87	27,810,909.05	31,736,205.27
1887–88	31,168,352.99	36,270,451.48
1888–89	33,932,226.79	38,527,239.84
1889–90	34,374,783.32	36,765,906.54
1890–91	38,486,601.49	38,439,494.21
1891–92	37,391,804.99	38,377,364.85
1892–93	37,474,879.20	40,367,047.58
1893–94	41,216,893.56	44,634,793.33
1894–95	46,907,123.16	45,078,551.95
1895–96	50,521,470.42	....

The authorized expenses of the Federal Government for the fiscal year 1896–1897 amount to $47,554,926.50. The State revenues, including the municipal taxes, collected during the last fiscal year amounted, approximately, to $28,000,000.

Our expenses as an independent nation are large, and as a comparatively small portion of our population are really producers of wealth, upon them lies the whole burden of such expenses; that is, we are a nation of from twelve to fifteen millions of inhabitants, with a very large territory and a large coast on both oceans, requiring army and police service and other expensive institutions proportionate to such extent and population, when the portion which contributes to such expenses is only about one-fifth of the same.

IMPORTS AND EXPORTS.

Before the railway era, Mexico could practically export only silver and gold, because transportation was so high on account of the broken condition of the country and the long distances that had to be passed over the mountains, that only articles of great value and comparatively small volume and weight, could be profitably transported; but since the railways have revolutionized transportation in the country, other natural products, especially agricultural ones, have begun to be exported, and their exportation is increasing considerably. As yet the precious metals, especially silver, are the main exports from Mexico, representing about 61 per cent. of our total annual exports; but other commodities are being developed and they are in a fair way to exceed in value the silver exports.

The following tables give the value of the total imports and exports from Mexico, as well as from and to the United States, for several years of which there are official data, compiled by the Bureau of Statistics of the Mexican Treasury Department:

TABLE SHOWING THE TOTAL IMPORTS TO MEXICO AND THE IMPORTS FROM THE UNITED STATES FROM THE FISCAL YEAR 1872–73 TO THE FISCAL YEAR 1895–96.

	IMPORTS FROM UNITED STATES. VALUE.	TOTAL IMPORTATIONS. VALUE.
1872–73	$5,231,255	$20,166,013
1873–74	5,946,614	23,282,299
1874–75	5,028,636	18,793,494
1884–85	5,045,531	11,893,342
1885–86	5,145,736	10,585,898
1888–89	22,669,421	40,024,894
1889–90	29,080,276	52,018,659
1892–93	26,235,963	43,413,131
1893–94	14,351,785	30,287,489
1894–95	15,130,367	34,000,440
1895–96	20,145,763	42,253,938

TABLE SHOWING THE TOTAL EXPORTS FROM MEXICO AND THE EXPORTS TO THE UNITED STATES OF AMERICA FROM THE FISCAL YEAR 1877–78 TO THE YEAR 1895–96.

	EXPORTS TO THE U. S.			TOTAL EXPORTS.		
	PRECIOUS METALS.	COMMODITIES.	TOTAL.	PRECIOUS METALS.	COMMODITIES.	TOTAL.
1877–8....	$8,664,052	$3,676,937	$12,340,989	$22,663,438	$6,622,223	$29,285,661
1878–9....	7,439,815	4,741,724	12,181,539	21,528,938	8,362,540	29,891,478
1879–80...	6,848,231	6,568,375	13.416,606	22,086,418	10,577,136	32,663.554
1880–1....	7,601,767	6,556,424	14,158,191	19,354,704	10,573,994	29,928,698
1881–2....	5,451,731	8,309,131	13,760,862	17,063,767	12,019,526	29,083,293
1882–3....	9,036,773	7,702,325	16,739,098	29,628,658	12,178,937	41,807,595
1883–4....	12,822,241	9,002,160	21,824,401	33,473,283	13,252,213	46,725,496
1884–5....	16,404,776	9,448,285	25,853,061	33,774,051	12,896,794	46,670,845
1885–6....	15,496,336	9,933,259	25,429,595	29,906,401	13,741,316	43,647,717
1886–7....	16,576,120	11,152,595	27,728,715	33,560,503	15,631,427	49,191,930
1887–8....	17,915,116	13,144,511	31,059,627	31,006,188	17,879,720	48,885,908
1888–9....	23,647,920	17,205,443	40,853,363	38,785,275	21,373,148	60,158,423
1889–90...	24,098,147	18,924,294	43,022,441	38,621,290	23,878,099	62,499,389
1890–1....	23,400,833	21,582,253	44,983,086	36,256,372	27,020,023	63,276,395
1891–2....	30,447,566	19.485,099	49,932,665	49,137,304	26,330,411	75,467,715
1892–3....	40,113,882	23,723,761	63,837,643	56.504,305	31,004,916	87,509,221
1893–4....	36,681,273	23,978,970	60,660,243	46,484,360	32,858,927	79.343 287
1894–5....	38,852,843	28,470,143	67.322,986	52,535,854	38,319,099	90,854,953
1895–6....	51,071.661	28,580,034	79,651,695	64,838,596	40,178,306	105,016,902
	$392,571,083	$272,185,723	$664,756,806	$677,209,705	$374,698,755	$1,051,908,460

The following is a table of the articles of merchandise exported from Mexico, and it appears from the same that they are all either mineral or agricultural products, especially raw materials:

METALS.		
Gold ore	$160,555	
Gold coin	169,794	
Gold bullion	20,377,663	
Silver ore	10,885,479	
Silver coin	5,246,418	
Silver bullion	26,345,160	
Sulphate of silver	1,030,156	
Foreign gold and silver and silver in other combinations	623,371	
Total		$64,838,596
COMMODITIES.		
Coffee	$8,103,302	
Henequen	6,763,821	
Cabinet and dye woods	4,206,880	
Copper	3,909,485	
Lead	2,531,624	
Live animals	3,546,770	
Hides and skins	2,331,999	
Chewing gum	1,527,838	
Tobacco	1,461,090	
Vanilla	1,428,675	
Ixtle	690,862	
Zacaton—broom root	616,492	
Cheak peas	352,737	
Coal	270,176	
Marble	258,668	
Fruits	246,150	
Sugar	169,662	
Horse hair, beans and jalap	247,768	
All others	1,514,307	
Total		40,178,306
		$105,016,902

The normal cost of transportation on merchandise from the City of Mexico to Vera Cruz, a distance of one hundred Mexican leagues or 263¾ English miles, used to be, before the railroad was built, $68.75 per ton of 2,200 pounds, or more than 26 cents per mile and ton; and in extraordinary circumstances, as during the French intervention in Mexico from 1861 to 1867, the freights were as high as $330 per ton, or over $1.25 per mile and ton. Therefore, no article could be transported unless it was very much needed and commanded a very high price. The result was that the people raised just enough to provide for the wants of themselves and their immediate neighbors. A fact that may seem incredible is that among the farmers a good crop was considered a great misfortune.

But with the opening of new roads, I have no doubt that if our exports continue to increase in the same proportions as they have done, Mexico will be able to supply the United States with most of the tropical products that are now consumed here, and even others that would be used if they could be cheaply transported.

Desiring to state the imports and exports of the United States to and from Mexico, I took such data, inserted below, from 1826 to 1858 from a book published in Washington in 1860 by Mr. Carlos Butterfield entitled "The United States and Mexican Mail Steamship Line and Statistics of Mexico," and from 1866 to 1896 from the official reports of the Bureau of Statistics of the United States Treasury Department.

THE FOLLOWING STATEMENT TAKEN FROM THE UNITED STATES TREASURY REPORT DEMONSTRATES THE COMMERCIAL TRANSACTIONS BETWEEN MEXICO AND THE UNITED STATES FROM 1826 TO 1858:

YEARS.	EXPORTS FROM MEXICO INTO THE UNITED STATES.	EXPORTS FROM THE UNITED STATES INTO MEXICO.
1826	$3.916,000	$6,281,000
1827	5,232,000	4,163,000
1828	4,814,000	2,886,000
1829	5,026,761	2,331,151
1830	5,235,241	4,837,458
1831	5,167,000	6,178,000
1832	4,293,954	3,467,541
1833	5,459,818	5,408,091
1834	8,666,668	5,265,053
1835	9,490,446	9,029,221
1836	5,615,819	6,040,635
1837	5,654,002	3,880,323
1838	3,127,153	2,787.362
1839	5,500,707	2,164,097
1840	4,175,000	2,515,341
1841	3,484,957	2,036,620
1842	1,996.694	1,534,493
1843	2,782,406	1,471,937
1844	2,387,000	1,794,833
1845	1,702,936	1,152,331
1846	1,836,621	1,531,180
1847	746,818	692,428
1848	1,581,247	4,058,446
1849	2,216,719	2,090,869
1850	2,135,336	2,012,827
1851	1,804,779	1,518,783
1852	1,649,206	2,284,929
1853	2,167,985	3,558,824
1854	3,463,190	3,135,486
1855	2,822,830	2,922,804
1856	3,568,681	3,702,239
1857	5,985,867	3,615,206
1858	5,477,465	3,315,825
Total	$129,245,327	$109,373,332
Average per year	3,916,525	3,325,377

YEAR ENDING.	EXPORTS TO			IMPORTS FROM	TOTAL IMPORTS AND EXPORTS.
	DOMESTIC.	FOREIGN.	TOTAL.		
1859........	$2,307,170	$685,376	$2,992,546	$5,339,974	$8,332,520
1860...... ..	3,338,759	2,015,334	5,354.093	6,935,872	12,289,965
1861........	1,564,062	651,828	2,215,890	3,689,213	5,905,103
1862........	1,840,720	340,454	2,181,174	2,684,852	4,866,026
1863........	7,493,167	1,579,045	9,072,212	4,529,584	13,601,796
1864........	10,927,960	1,753,594	12,681,554	7,884,391	20,565,945
1865........	14,484,213	2,530,867	17,015,080	7,354,173	24,369,253
1866........	3,701,599	871,619	4,573,218	1,726,092	6,299,310
1867........	4,823,614	572,182	5,395,796	1,071,936	6,467,732
1868........	5,048,420	1,392,919	6,441,339	1,590,667	8,032,006
1869........	3,835,699	1,047,408	4,883,107	2,336,164	7,219,271
1870	4,544,745	1,314,955	5,859,700	2,715,665	8,575,365
1871........	5,044,033	2,568,080	7,612,113	3,209,688	10,821,801
1872.......	3,420,658	2,132,931	5,543,589	4,002,920	9,546,509
1873........	3,941,019	2,323,882	6,264,901	4,276,165	10,541,066
1874........	4,016,148	1,930,691	5,946,839	4,346,364	10,293,203
1875........	3,872,004	1,865,278	5,737,282	5,174,594	10,911,876
1876........	4,700,978	1,499,594	6,200,572	5,150,572	11,351,144
1877........	4,503,802	1,389,692	5,893,494	5,204,264	11,097,758
1878........	5,811,429	1,649,275	7,460,704	5,251,502	12,712,206
1879........	5,400,380	1,351,864	6,752,244	5,493,221	12,245,465
1880........	6,065,974	1,800,519	7,866,493	7,209,593	15,076,086
1881........	9,198,077	1,973,161	11,171,238	8,317,802	19,489,040
1882........	13,324,505	2,158,077	15,482,582	8,461,899	23,944,481
1883........	14,370,992	2,216,628	16,587,620	8,177,123	24,764,743
1884........	11,089,603	1,614,689	12,704,292	9,016,486	21,720,778
1885........	7,370,599	970,185	8,340,784	9,267,021	17,607,805
1886.	6,856,077	881,546	7,737,623	10,687,972	18,425,595
1887........	7,267,129	692,428	7,959,557	14,719,840	22,679,397
1888........	9,242,188	655,584	9,897,772	17,329,889	27,227,661
1889........	10,886,288	600,608	11,486,896	21,253,601	32,740,497
1890.......	12,666,108	619,179	13,285,287	22,690,915	36,976,202
1891........	14,199,080	770,540	14,969,620	27,295,992	41,588,991
1892	13,696,531	597,468	14,293,999	28,107,525	42,401,524
1893.... ..	18,891,714	676,920	19,568,634	33,555,099	53,123,733
1894........	12,441,805	400,344	12,842,149	28,727,006	41,569,155
1895........	14,582,484	423,422	15,005,906	15,635,788	30,641,694
1896..... ..	18,686,797	763,459	19,450,256	17,456,177	36,906,433

NOTE.—In the absence of law providing for the collection of statistics of exports to adjacent foreign territory over railways, the values of exports to Mexico, from 1883 to 1893 inclusive, have been considerably understated. Since March, 1893, there has been a law in force for the collection of exports by railways. According to official information from Mexican sources, the value of imports into that country from the United States during the year ending June 30, 1888, was $19,264,673, including precious metals valued at $38,362. Prior to 1866 the figures include gold and silver imported and exported. For 1866 and subsequent years, merchandise only.—*Foot note from Statistical Bureau Report.*

The following table contains a detailed statement of the commodities imported into the United States from Mexico, and exported from the United States to Mexico, during the years from 1858 to 1896, prepared by the Bureau of Statistics of the Treasury Department of the United States of America:

STATEMENT SHOWING THE QUANTITIES AND VALUES OF THE PRINCIPAL AND ALL OTHER ARTICLES OF IMPORTS INTO THE UNITED STATES FROM, AND OF EXPORTS FROM THE UNITED STATES TO, MEXICO, 1858–1883.

IMPORTS OF MERCHANDISE FROM MEXICO.

YEAR ENDED JUNE 30—	BREADSTUFFS AND OTHER FARINACEOUS FOOD.*		COFFEE.		COPPER, PIGS, BARS, INGOTS, OLD, AND OTHER UNMANUFACTURED.		CHEMICALS, DRUGS, DYES AND MEDICINES.			HIDES AND SKINS OTHER THAN FURS.	HAIR UNMANUFACTURED.	INDIA RUBBER AND GUTTA-PERCHA, CRUDE, OR UNMANUFACTURED.		JUTE, AND OTHER GRASSES, RAW.	
	Indian corn.	All other.	POUNDS.		POUNDS.		Cochineal and indigo.	Dye-woods in sticks.	All other.†			POUNDS.		TONS.	
1858..	$34,686	$28,198	29,687	$3,259	....	$1,437	‡$31,793	$107,649	$1,030	$496,929	$11,261	....	$143	406	$50,173
1859..	45.520	15,794	45 518	6,036	....	3,638	144,437	46.208	1,336	457,297	485	....	....	389	44,861
1860..	28,940	5,124	549,265	64,616	....	10,542	49,651	161,115	110	535.591	2,074	....	107	251	25,114
1861..	19,612	8,445	461,416	59,405	....	1,320	91,645	115.757	411	267,527	2,264	....	....	382	35,670
1862..	....	6,399	7,175	1,026	12,958	1,734	49,564	91,976	....	171,905	11,535	1,586	252	286	23,537
1863..	....	15,048	935,594	122,663	85,796	14.081	91 151	48,094	10,830	383,530	912	....	....	898	44,647
1864..	....	9,818	11,736	2,927	129,810	21,401	123,434	110,299	12,622	563,978	2,140	....	201	843	63,455
1865..	....	6,337	505	109	114,761	16,528	132,959	136,341	7,127	547,109	1,667	....	20	333	36,496
1866..	....	....	524.777	84,478	40,299	5,629	96,362	69,350	40.722	325,186	3,196	....	214	889	104,453
1867..	9,975	5.183	138,005	18,468	20,497	3,001	130,154	108,754	39,024	368,817	2,808	....	228	862	116,455
1868..	34,269	29,599	882,521	112,159	29,536	3,123	144,144	187,337	38,526	411.505	2,613	2,554	600	1,513	237,803
1869..	71,163	53,140	203,048	22,062	57,700	7,326	144,974	207,859	64,510	745.550	2,728	34,842	8,648	2,906	469.235
1870..	79.321	48.551	110,607	13,223	24,197	2,304	‡92,836	244.932	28,380	833,743	4.697	98,656	23,594	3,300	631,090
1871..	104,554	68.313	526,495	59.454	161,711	18,608	117,745	36,698	53,306	714,489	6,442	93,046	33,055	3,328	626,044
1872..	74,297	43.114	1,878,301	248,022	2,468	218	104.772	39,660	286,781	1,380,082	15,940	106,417	34,792	4,244	784,809
1873..	53,547	62,720	2,035,540	314,347	39,704	3,120	55,239	27,752	163,745	1,903,387	55,420	184,554	63,269	3,590	534,980
1874..	61,082	37.720	2,930,285	624,611	14,028	2,161	61,964	65,662	70,090	1,561,830	18,625	72,963	23,710	4,867	694,254
1875..	33,628	31,002	2,691,889	485,489	4,611	620	54.519	63,958	158,279	2,077,156	28,784	115,607	35,690	6,185	613,338
1876..	45.990	49,022	3,941,229	713,833	23,050	2,490	39,736	150,413	247,427	1,812,567	79,230	39,835	11,103	6,846	542,756
1877..	25,791	39,411	6,789,693	1,265,970	67.793	7,917	52,726	72.402	219,193	1,529,702	29,317	43,314	13,825	7,278	656,746
1878..	12,321	34.339	6,337,063	1,082,272	68,556	7.082	‡23,196	112,482	204.135	1,565,546	42,710	40,494	11,364	9.163	889,061
1879..	33.497	56,432	8.307,040	1.371,979	18,443	3.302	62,483	96,877	159,017	1,675,777	34,274	17,500	4,432	10,197	930,396
1880..	65,230	65,192	9,818,525	1,523,658	226	19	68,345	149,651	106,706	1,951,918	36,964	107,025	44,235	14,086	1,324,075
1881..	87,840	43,141	13,911,910	1,730,838	55,740	6,825	20,973	160,070	263,642	2,111,750	39,701	616,742	315,059	17,153	1,634,215
1882..	58,648	41,352	17,020,669	1,817,584	3,562	494	5,813	128,734	198,030	1,525,107	38 810	325,206	164,847	19,233	2,061,909
1883..	22,072	50,192	8,573,532	809,757	124	8	....	211,714	119,681	1,568,645	52,985	241,478	123,484	25,065	2,712,088

* All other breadstuffs comprise barley, barley malt, bread and biscuit, oats, rice, rye, wheat, wheat flour, meal of all kinds, peas and beans; all other farinaceous food and preparations of breadstuffs.

† All other chemicals, drugs, dyes and medicines include: Argols; medicinal barks; camphor, crude; madder; soda, nitrate of; gums; cutch and catechu; opium; soda and salts of; sulphur or brimstone; chloride of lime or bleaching powder; all chemicals, not elsewhere specified.

‡ Cochineal only; no indigo included.

Mexico, 1858-1883—*Continued.*

IMPORTS OF MERCHANDISE FROM MEXICO—*Continued.*

YEAR ENDED JUNE 30 –	LEAD, PIGS, BARS, AND OLD.		ANIMALS, LIVING.	PRECIOUS STONES.	SALT.	SPICES OF ALL KINDS.	SUGAR AND MOLASSES OF ALL KINDS.	WOOL, RAW AND FLEECE.		WOOD, UNMANUFACTURED.	OTHER MERCHANDISE.	TOTAL IMPORTS OF MERCHANDISE.
	POUNDS.							POUNDS.				
1858	36,517	$825	....	....	$6,285	$1,252	$9,569	....	$4,137	$43,674	$275,901	$1,108,501
1859	91,440	1,829	....	....	11,321	1,272	8,273	....	9,864	55,949	389,964	1,244,084
1860	320,141	6,203	....	....	22,555	642	55,309	....	15,151	101,392	819,195	1,903,431
1861	57,482	1,150	....	....	12,266	1,835	23,333	....	1,641	102,711	141,120	886,112
1862	....	....	....	....	16,138	1,551	10,886	31,209	3,560	51,415	*289,510	817,809
1863	295,136	13,988	....	....	40,871	3,959	45,576	1,226,820	155,450	69,014	†1,984,068	3,043,882
1864	4,699	297	....	....	36,247	22,873	12,019	702,676	96,503	62,342	‡4,987,889	6,128,445
1865	648	60	....	....	6,452	10,836	816	....	45,490	83,921	§5,188,606	6,220,874
1866	25,152	1,509	....	....	12,326	30,920	79,904	163,297	18,667	82,908	‖770,268	1,726,092
1867	....	....	....	....	13,645	19,041	1,693	....	377	106,921	127,392	1,071,936
1868	79,504	2,799	....	....	21,368	40,324	29,735	69,493	4,386	72,973	217,404	1,590,667
1869	523,043	22,211	....	....	13,716	33,841	65,197	716,068	51,838	126,345	225,821	2,336,164
1870	456,516	14,607	....	....	30,235	104,476	28,123	656,459	49,829	107,808	377,916	2,715,665
1871	725,211	23,261	....	....	29,600	124,403	39,877	865,909	68,907	176,724	908,208	3,209,688
1872	461,274	14,653	$188,558	$32,449	20,984	10,396	52,007	1,182,481	128,375	279,020	263,991	4,002,920
1873	392,440	19,304	147,512	330	6,963	1,613	11,818	1,182,414	129,475	171,554	550,070	4,276,165
1874	817,579	41,978	134,701	102,048	9,844	2,100	17,682	1,173,099	112,226	324,520	379,557	4,346,364
1875	325,648	16,689	81,439	156,690	8,201	1,882	104,547	1,095,282	119,534	346,923	756,226	5,174,594
1876	837,698	42,253	108 050	63,329	6,803	1,520	164,567	838,798	85,887	247,833	735,763	5,150,572
1877	1,336,641	68,218	129,897	6,355	7,196	5,481	227,543	1,405,983	119,708	133,690	533,176	5,204,264
1878	1,136,453	58,245	132,971	1,540	6,768	1,650	155,700	835,487	72,216	257,853	580,051	5,251 502
1879	407,276	20,839	132,873	3,927	6,138	3,760	76,992	819,784	66,300	224,925	529,001	5,493,221
1880	....	....	175,305	5,416	8,419	9,040	232,655	1,321,874	144,875	408,754	889,136	7,209,593
1881	630,947	27,661	314,272	21,657	7,178	5,219	124,535	1,009,376	99,479	329,295	974,452	8,317 802
1882	1,132,064	44,365	455,917	76,241	802	8,428	104,374	191,666	18,037	499,776	1,212,601	8,461,899
1883	1,191,225	26,919	661,245	56,176	973	10,775	64,527	1,775	257	441,083	1,244,542	8,177,123

* Of this amount $60,497 was the value of unmanufactured cotton.

† Of this amount $1,750,615 was the value of unmanufactured cotton.

‡ Of this amount $4,859,725 was the value of unmanufactured cotton.

§ Of this amount $5,128,875 was the value of unmanufactured cotton.

‖ Of this amount $417,197 was the value of unmanufactured cotton.

Mexico, 1858–1883—*Continued.*

EXPORTS OF DOMESTIC MERCHANDISE TO MEXICO.

YEAR ENDED JUNE 30—	SHEEP.		BREAD AND BREADSTUFFS.				COTTON, RAW OR UNMANUFACTURED.	
			Indian corn.		Wheat and wheat-flour.	All other.*		
	NO.		BUSHELS.				POUNDS.	
1858	......	......	49,579	$37,676	$139,673	$3,629	9,084,609	$1,074,818
1859	......	......	48,932	29,886	184,223	4,137	5,993,635	883,337
1860	......	......	80,329	78,063	247,206	8,247	9,043,377	1,076,150
1861	......	......	13,877	9,993	109,033	10,920	1,410,659	153,905
1862	......	......	18,364	14,017	282,810	31,915	......	......
1863	......	......	268,653	263,849	777,122	379,727	......	......
1864	......	......	187,014	256,924	855,772	50,730	417,497	331,199
1865	280	$740	181,462	347,464	1,089,016	90,238	......	......
1866	33	590	158,624	121,553	584,012	66,227	50,317	17,611
1867	543	2,800	14,218	16,874	547,965	117,066	3,310,842	934,458
1868	3,156	2,253	7,292	9,051	343,205	10,938	8,228,598	1,349,685
1869	(†)	(†)	72,216	72,439	278,111	10,923	2,042,224	458,405
1870	27,481	18,189	62,859	65,292	209,371	11,911	6,609,707	1,412,863
1871	36,347	32,837	173,585	169,350	225,718	14,069	11,309,498	1,586,517
1872	27,228	25,843	21,039	27,233	218,279	35,166	957,209	128,186
1873	57,217	59,935	104,146	99,166	110,525	22,310	550,639	74,352
1874	111,445	110,290	55,881	40,049	96,666	25,449	2,289,561	322,507
1875	112,553	133,222	9,862	9,092	102,173	21,532	1,305,276	184,186
1876	95,215	104,865	93,487	75,945	108,952	26.580	6,972,575	890,574
1877	161,549	144,908	64,776	55,658	88,913	23,756	3,969,812	462,902
1878	153,065	158,217	288,109	267,623	171,450	51,885	3.422,162	357,210
1879	89,689	103,789	126,613	95,802	129,971	50,001	9,898,129	912,583
1880	115,265	120,817	85,702	68,743	69,072	44,126	9,881,543	1,176,067
1881	108,886	118,498	352,510	240,182	93,757	60,198	13,386,186	1,494,101
1882	81,338	112,421	419,263	332,642	103,528	91,475	12,537,650	1,447,522
1883	235,585	364,866	476,453	391,751	178,408	118,744	20,577,771	2,217,259

* Bread and breadstuffs, all other, comprise barley, bread and biscuit, Indian-corn meal, oats, rye, rye-flour, other small grain and pulse, maizena, farina, and all other breadstuffs, or preparations of, used as food.

† Classed under the general heading "Animals, living, all kinds," total $156,773.

EXPORTS OF DOMESTIC MERCHANDISE TO MEXICO—*Continued.*

YEAR ENDED JUNE 30—	COTTON, MANUFACTURES OF.					DRUGS, CHEMICALS, MEDICINES, ACIDS, ASHES, AND DYE-STUFFS.	GLASS AND GLASSWARE.	IRON AND STEEL, AND MANUFACTURES OF*	LEATHER, AND MANUFACTURES OF.	
	Colored.		Uncolored.		All other.				Boots and Shoes.	All other.
	YARDS.		YARDS.							
1858	....	....	....	....	$281,504	$29,957	$8,011	$188,214	$1,066	$4,404
1859	....	....	....	....	312,203	34,280	7,637	91,472	9,345	5,873
1860	....	....	....	....	641,870	63,727	5,981	329,326	8,929	4,294
1861	....	....	....	....	312,695	48,710	5,763	255,327	4,562	6,395
1862	....	....	....	....	157,874	75,194	14,486	265 225	9,676	4,607
1863	....	....	....	....	1,784,531	118,604	43,224	704,944	289,543	112,334
1864	....	....	....	....	717,622	166,741	40,670	1,165,541	373,146	67,404
1865	....	....	....	....	2,222,410	326,675	126,447	1,423,571	1,119,848	160,203
1866	....	....	3,718	$1,049	58,663	89,690	23,515	420,034	32,131	35,114
1867	141,780	$29,186	45,383	9,915	356,163	68,137	16,813	770,150	21,533	21,639
1868	397,472	51,828	407,619	68,023	387,610	85,635	27 010	784,897	61,227	23,874
1869	(†)	(†)	(†)	(†)	341,593	73,572	27,076	811,384	95,590	18,430
1870	1,049,621	149,569	601,927	76,127	106,373	113,105	21,217	654,298	116,761	11,591
1871	758,338	102,254	1,451.727	162,934	94,366	96,248	18,905	698,296	91,070	16,970
1872	559,411	84,387	1,355,636	156,537	38 368	93,734	26,419	803,668	98,565	18,480
1873	500,156	66,185	1,258,921	155,657	73,244	107,436	26,752	1 043 071	104,377	13,613
1874	277,032	35,357	1,086,883	123,009	50,337	126,437	20,007	1,073,530	70,417	12,757
1875	569,855	62,724	1,019,997	104,608	64,189	112,877	37,561	954,061	84,129	26,026
1876	1,210,286	111,351	2,143,975	201,513	60,595	111,348	20,743	1,062,687	79,153	11,182
1877	6,255,489	513,488	5,876,817	486,159	64,450	79,799	24,763	786,265	53 383	14,233
1878	10,104,048	746,301	5,726.156	468,717	87,278	123,069	56,898	1,201,574	60,950	27,719
1879	7,663,001	509,255	3,886,748	286,205	69,852	127,756	47,831	996,080	58,500	21,124
1880	6.402,170	501,648	2,808,228	224,181	106,406	145,331	54,781	1,257,731	53,466	25,133
1881	6,874,372	512,195	3,657,611	312,824	193,630	212,477	87,313	2,582,346	48,207	45,953
1882	6,745,817	504,619	3.838,669	318,517	296,132	288,824	111,542	4,239,712	85,327	65,517
1883	6,114,541	441,252	3,523,873	292,009	185,329	265,220	159,099	3,772,287	86,788	65,102

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* Including, also, printing presses and type, scales and balances, sewing machines and parts of, steam and other fire engines and apparatus.

† Included in "All other."

EXPORTS OF DOMESTIC MERCHANDISE TO MEXICO—*Continued.*

YEAR ENDED JUNE 30—	REFINED ILLUMINATING MINERAL OIL.	ORDNANCE STORES.			PROVISIONS.*					QUICKSILVER.	SUGAR AND MOLASSES.	TOBACCO & MANUFACTURES OF.	WOOD AND MANUFACTURES OF.	OTHER MERCHANDISE.	TOTAL EXPORTS OF DOMESTIC MERCHANDISE.	TOTAL EXPORTS OF FOREIGN MERCHANDISE.	TOTAL EXPORTS OF MERCHANDISE.
		Cartridges and Fuses.	Gunpowder.	All other.	Bacon and Hams.		Lard.		All other.*								
					POUNDS.		POUNDS.										
1858......	....	....	$7,015	....	49,198	$6,280	526,208	$67,902	$19,382	$77,490	$3,047	$15,387	$62,763	$754,634	$2,782,852	$529,973	$3.312,825
1859......	....	....	14.409	....	43,431	5,202	679,033	65,413	19,319	....	7,054	14.163	61,496	502,713	2,252.162	667,580	2,919,742
1860......	....	....	66,523	....	60,551	7,709	906,106	103,120	24,305	103,128	21,259	9,527	84,372	425,643	3,309,379	2,015,334	5,324,713
1861......	....	....	25,775	....	37,502	4,885	117,487	17,344	16,712	197,765	11,391	9,526	55,465	302,896	1,559,062	651,364	2,210,426
1862......	....	....	4,906	....	69,170	6,453	656,851	56,692	31,093	436,231	5,723	22,700	78,900	342,218	1,840,720	340,454	2,181,174
1863......	....	....	6.115	....	487,992	49,440	1,357,512	150,279	110,627	572,436	13,922	202,234	326,014	1,536,634	7,441,579	1,579,045	9,020,624
1864......	$15,901	....	6,244	....	321,760	40,781	2,825,411	340.683	191,442	302,222	53,275	270,972	544,885	1,972,979	7,765,133	1,505,464	9,270,597
1865......	26,657	....	....	....	294,721	59,750	2,334,693	453,797	295,006	207,090	36,364	436,420	872,314	4,525,962	13,819,972	2,530,867	16,350,839
1866......	97,687	....	1,750	....	120,353	28,264	889,408	212,256	134,121	182,120	34,593	26,663	211,876	1,322,080	3,701,599	871,619	4,573,218
1867......	60,887	$34,317	16,957	$32,457	93,418	18,402	893,794	137,262	112,476	379,238	53,699	32,763	137,319	895,138	4,823,614	572,182	5,395,796
1868......	92,909	10,790	26,573	26,213	98,490	16,710	981,178	134,619	64,739	335,729	32,847	27,354	179,130	895,571	5,048,420	1,392,919	6,441.339
1869......	64,657	....	20,968	....	68,113	12.658	630,541	108 798	40,136	328,117	44,025	91,301	141,477	796,039	3,835,699	1,047,408	4,883,107
1870......	157,034	32,839	26,220	6,978	95,852	17,555	734,683	124,107	63,028	225,301	26,254	87,690	151,231	659,841	4,544,745	1,314,955	5,859,700
1871......	90,073	26,756	24,274	2,838	210,770	30,010	764,704	93,708	60,149	325,980	13,385	129,567	144,227	793,532	5,044,033	2,568,080	7,612,113
1872......	172.280	55,272	40,800	271	296,001	31,686	1,079,754	121,082	69,848	177,316	33,268	71,239	178,636	714.095	3,420,658	2,122,931	5,543.589
1873......	143,149	70.139	46,834	130	277,536	33,918	808,445	83.081	65,749	263,370	138,572	140,750	156,058	842,646	3,941,019	2,323,882	6,264,901
1874......	164,160	47,608	23.788	314	269,862	28,052	364,646	36,628	58,118	405,048	127,613	91,218	251,951	674,838	4,016,148	1,930,691	5,946,839
1875......	108,368	68,432	28,807	212	110,799	14,909	388,420	52,243	53,456	471,808	59,328	100,499	253,249	763,413	3,872,004	1,865,278	5,737,282
1876......	171,348	146,390	25.210	9.746	128,983	19,338	311,862	41,762	61,463	365,097	38,442	109,546	226,816	620,332	4,700,978	1,499.594	6,200,572
1877......	221,894	57,578	26,672	302	64,360	9,091	550,718	63,491	54,972	352,606	58,485	147,347	161,013	551,574	4,503,802	1,389,692	5,893,494
1878......	173,438	118,793	34,867	....	141,505	16,565	1,255,063	137,119	81,543	290,249	75,704	122,844	252,055	729,361	5,811,429	1,649,275	7,460.704
1879......	152,438	73,914	43,742	1,141	75,645	9,378	1,204,422	102,052	71,820	344,006	38,800	160,516	240,289	753,535	5,400,380	1,351,864	6,752,244
1880......	155,328	80,113	49,627	256	90 496	11,312	1,508,525	126,319	77,512	377,825	41,673	152,791	274,532	871,184	6,065,974	1,800,519	7,866,493
1881......	173,155	95,230	145,397	....	169,312	19,765	1,313,086	132,597	97,534	462,159	63,750	135,174	544,201	1,327,434	9,198,077	1,973,161	11,171,238
1882.....	226,115	98,303	226,125	....	214,523	31,013	1,183,647	145,293	136,198	316,714	71,582	142,671	1,426,411	2,506,302	13,324,505	2,158,077	15,482,582
1883......	249,404	119,491	303,783	....	243,583	37,955	1,392,134	163,797	142,213	394,572	73,298	141,185	1,385,420	2,821,760	14,370,992	2,216,628	16,587,620

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* Provisions, all other, comprise: Beef, salted or cured; beef, fresh; butter, cheese, condensed milk; eggs; fish, dried, smoked, fresh, pickled, other cured; meats, preserved mutton, fresh; oysters; pickles and sauces; pork; onions; potatoes; other vegetables; vegetables, prepared or preserved.

STATEMENT SHOWING THE QUANTITIES AND VALUES OF THE PRINCIPAL AND ALL OTHER ARTICLES OF IMPORTS INTO THE UNITED STATES FROM, AND OF EXPORTS FROM THE UNITED STATES TO, MEXICO, DURING EACH OF THE YEARS SPECIFIED BELOW.

MERCHANDISE.

MEXICO, 1889–1896.

YEAR ENDING JUNE 30—	IMPORTS OF MERCHANDISE.																
	Breadstuffs and other farinaceous food.		Coffee.		Copper: Pigs, bars, ingots, old, and other unmanufactured.		Chemicals, drugs, dyes, and medicines.			Hides and skins, other than fur skins.	Hair unmanufactured.	India rubber and gutta percha, crude.		Jute and other grasses unmanufactured.		Lead and Manufactures of.	
	Corn.	All other.					Cochineal and indigo.	Dye-woods in sticks.	All other.								
			POUNDS.		POUNDS.							POUNDS.		TONS.		POUNDS.	
1889...	$1,082	$1,837	18,243.317	$2,895,862	81,471	$4,893	$1,000	$187,862	$1,142,124	$1,526,915	$47,452	233,996	$81,800	41,389	$6,257,610	....	$549,257
1890...	871	3,025	20,666,975	3,542,851	39.607	2,948	12,571	194,532	1,155.350	1,579,250	57,066	177,801	59,826	42,787	5,851,822	....	657,658
1891...	1.463	22,046	28,489,632	5,094,839	283,744	23,560	10,915	162,445	1,888.813	1,646,369	61,098	169,343	56,669	56.360	6,047,593	....	1,847,969
1892...	8,102	3.165	21,921,549	4,037,592	1,106,222	84,175	3,745	119,457	1,396,667	1,704,872	60.557	120,528	41,802	52,021	5,542,985	....	3.596,728
1893...	1,093	2,279	25,417,152	4,297,880	1,521,762	134,997	38,411	145,725	1,340,088	1,653,775	61,711	140,096	41,367	60,550	6,687,947	....	5,646,481
1894...	924	1,828	38,160,641	6,964,034	1,821,163	213,377	681	88,390	1,245,525	1,438,277	57,064	120,415	33,750	52,723	3,949,401	....	6,463,346
1895...	6,920	10,283	35 262,229	5,971,439	2,213,101	155,645	345	102,160	953,185	1,433,945	43,846	160,808	54,868	59,706	3,375,998	....	1,423,150
1896...	1,465	12,201	23,975,477	4,040,443	5,544,429	452,712	318	125,774	2,049,715	1,519,301	43,261	124,343	41,489	65,441	4,239,531	....	1,350,713

IMPORTS INTO, AND EXPORTS FROM, THE UNITED STATES FROM AND TO MEXICO, ETC.—*Continued.*

MEXICO, 1889–1896—*Continued.*

YEAR ENDING JUNE 30—	IMPORTS OF MERCHANDISE.									
	Animals.	Precious stones.	Salt.	Spices of all kinds.	Sugar and molasses.	Wool, unmanufactured.		Wood, unmanufactured.	Other merchandise.	Total imports of merchandise.
						POUNDS.				
1889	$399,493	$11,956	$2,302	$9,278	$7,022	761,828	$67,711	$301,142	$7,757,003	$21,253,601
1890	417,025	57,614	3,546	16,413	27,129	322,166	30,614	441,620	8,579,184	22,690,915
1891	140,642	3,025	4,659	11,507	35,460	1,709	158	470,564	9,764,647	27,295,994
1892	20,257	911	2,369	12,575	40,790	263	41	699,033	10,731,702	28,107,525
1893	36,391	1,164	11,933	19,891	48,157	92,709	10,727	631,238	12,743.844	33,555,099
1894	24.415	3,672	387	19,595	69.618	5.708	632	360,490	7,791,600	28,727,006
1895	760,000	10,121	440	166	55.136	74.574	3,928	230,499	1,043,700	15,635.788
1896	1,520,044	3,840	2	14,066	63,622	95 834	3,964	595,523	1.378,193	17,456,177

IMPORTS INTO, AND EXPORTS FROM, THE UNITED STATES FROM AND TO MEXICO, ETC.—*Continued.*

MEXICO, 1889–1896—*Continued.*

YEAR ENDING JUNE 30—	EXPORTS OF DOMESTIC MERCHANDISE.								
	ANIMALS.		BREADSTUFFS.				Chemicals, drugs, dyes and medicines.	Cotton, unmanufactured.	
	Sheep.		Corn.		Wheat and wheat flour.	All other.			
	NUMBER.		BUSHELS.					POUNDS.	
1889	77,569	$122,193	434,997	$194,778	$185,746	$85,558	$329,487	16,901,267	$1,607,395
1890	26,814	47,947	961.458	481,052	166,769	100,997	362,328	13,047,474	1,217.805
1891	9.147	21,464	615,332	389,619	213,299	125,718	377,586	12,841,122	1,281,972
1892	2,827	5,068	754,548	489,702	184,299	127,443	440,297	22,117,381	1,844,500
1893	1,310	4,682	6,960,356	4,343,777	239,576	144,031	418,452	20,905,980	1,890,461
1894	5,443	9,085	431,516	220,362	197,192	100,568	341,989	17,582,418	1.391,836
1895	909	3,338	179,611	108,272	175.637	80,649	408,795	37,976,422	2,352,299
1896	2,182	9,693	1,676,758	672,093	167,680	85,542	469,193	19,408,420	1,643,183

Imports into, and Exports from, the United States from and to Mexico, etc.—*Continued.*

MEXICO, 1889–1896—*Continued.*

Year ending June 30—	Exports of Domestic Merchandise.										
	Cotton, manufactures of.					Glass and Glassware.	Gunpowder and other explosives.		Iron and steel, and manufactures of.	Leather, and manufactures of.	
	Cloths, colored.		Cloths, uncolored.		All other.		Gunpowder.	All other explosives.		Boots and Shoes.	All other.
	Yards.		Yards.								
1889	7,735,000	$461,765	1,845,659	$138,904	$218,293	$76,833	$10,227	$283,794	$2,290,757	$39,981	$48,648
1890	5,434,882	314,882	2,048,130	153,875	179 402	94,697	15,723	348,845	2,700,979	38,959	54,794
1891	5,450,725	317,576	1,706,327	126,753	158,053	126,688	18,080	375,320	3,414,397	24,366	48,231
1892	6,381,992	347,687	1,937 489	144,392	155,362	123,546	28,589	339 625	3,834,343	21,984	38,702
1893	3,245,200	205,250	1,000,704	86,643	140,323	117,979	8,787	410,513	3,802,876	26,731	42,308
1894	3,184,205	197,855	1,368,663	111,236	151,575	112,972	6,265	454,775	3,198,597	24,843	58,245
1895	4,278,358	244,114	2,159,210	145,430	151,924	121,488	43,028	572,031	3,703,566	26,532	51,648
1896	5,348,802	311,532	2,540,396	182,833	322,729	162,628	74,805	587,706	5,239,307	45,115	66,943

IMPORTS INTO, AND EXPORTS FROM, THE UNITED STATES FROM AND TO MEXICO, ETC.—*Continued.*

MEXICO, 1889–1896—*Continued.*

YEAR ENDING JUNE 30—	EXPORTS OF DOMESTIC MERCHANDISE.												Total exports of foreign merchandise.
	Oils; Mineral, refined.	PROVISIONS, COMPRISING MEAT AND DAIRY PRODUCTS.					Quick-silver.	Sugar and molasses.	Tobacco, and manufactures of.	Wood, and manufactures of.	Other merchandise.	Total exports of domestic merchandise.	
		Bacon and hams.		Lard.		All other.							
		POUNDS.		POUNDS.									
1889	$248,381	297,657	$41,289	1,363,539	$128,169	$386,117	$144,734	$66,843	$133,727	$964,310	$2,678,444	$10,886,288	$600,608
1890	234 435	259,658	34,021	1,639,255	119,976	433,962	169,341	42,035	130,440	1,303,448	3,919,396	12,666,108	619,179
1891	301,829	341,135	38,999	1,611,313	109,816	228,245	68,112	36,493	73,535	1,483,903	5,839,026	14,199,080	770,540
1892	238,952	436,827	48,280	2,050,997	142,253	193,414	111,349	34,442	89,394	1,206,672	3,506,236	13 696,531	597,468
1893	198,740	422,389	53,008	3,863,457	308,449	233,417	143,381	73,545	126,745	1,200,486	4,671,554	18,891,714	676.920
1894	146,626	268,993	34,993	1,414,292	116,198	173,281	361,781	57,452	129,205	998,805	3,846,069	12,441,805	400,344
1895	181,092	297,599	33,754	1,908,076	128.779	164,853	381,621	37,402	167,665	1,048,844	4,249,723	14,582,484	423,422
1896	142,819	340,546	38,113	3,440,157	209,727	167,490	466,259	38,731	175,541	1,611,477	5,795,658	18,686,797	763,459

CIRCULATION.

We have been very fortunate in not having any paper circulation in Mexico. Notwithstanding the great need of money that the Mexican Government has had on different occasions, it has never thought of an issue of paper money, since the deplorable results of the one made in 1823, which discredited paper money so greatly that no Government in Mexico ever dared to again issue any, and we have been free from all the difficulties which depreciated paper money circulation has caused in most of the other American Republics.

There are a few banks of issue in Mexico which are authorized to issue paper, but this is not a legal tender, and their issue is covered by deposits of large amounts of money. I take the following statement, made after consultation with the leading banking houses of the country, which shows the amount they held in cash and the uncovered paper issued by the same on June 30, 1896:

	CASH.	UNCOVERED PAPER.
National Bank	$28,593,450.71	None.
Bank of London and Mexico	7,093,431.55	$2,403,044.45
International and Mortgage Bank	1,295,730.36	None.
Monte de Piedad	316,855.71	None.
Bank of Nuevo Leon	460,244.01	462,231.99
Chihuahua Mining Bank	560,137.12	528,063.88
Bank of Yucatan	672,821.75	356,684.25
Bank of Zacatecas	491,848.27	....
Mercantile Bank of Yucatan	983,091.97	....
Bank of Durango	344,468.95	77,989.05
Commercial Bank of Chihuahua (July 15, 1896)	92,188.22	74,254.18
	$40,904,268.62	$3,902,267.80

The above table includes only uncovered notes. The note circulation of the National Bank of Mexico on the dates mentioned was, for example, $21,250,154, but neither that nor the covered circulation of the other banks is mentioned, only that amount of paper being considered which has been absorbed by the commercial community in excess of the equivalent in silver held by the issuing institution.

The amount of money in circulation has been calculated at the following figures, and I think it may be safely stated that at least twice that amount in silver dollars is now in circulation in Mexico:

Cash held by the banks	$41,000,000
Cash in private hands	60,000,000
Uncovered note circulation, say	4,000,000
Total	$105,000,000

Distributed among a population of 12,578,861, this amount gives $8.34 per capita, but if the Indians be excluded from the population, not being as yet appreciable factors in the great equation of civilization and progress, and the above amount be divided among the remaining, say 6,000,000 active agents in the country's advancement, the per capita circulation figures out at $17.50, a sum which will bear comparison with that of countries figuring in the front rank of civilization.

BANKING.

Banking in Mexico is in its incipient state. The National Bank of Mexico, established in the City of Mexico since 1882, with branches in the principal cities of the country, has a monopoly for the issuing of notes in the capital, which is only shared by such banks as were in existence before the National Bank of Mexico was chartered, like the Bank of London, Mexico and South America, established during the French intervention in Mexico and recently remodeled under the name of the Bank of London and Mexico. The Mortgage Bank of Mexico enjoys that privilege also.

On June 3d, 1896, a general banking law was issued by the Mexican Congress which establishes the conditions under which banking institutions can be organized, but, of course, that does not affect the rights of the National Bank and other banks in the City of Mexico.

Formerly, owing to the expense and dangers of transportation, it was difficult to transport money from one place to another, and therefore exchange between cities in Mexico was very high, sometimes even ten per cent. from one city to another in the country. The rate has been reduced considerably since the railroads were built, but it is still quite high. To draw money from the City of Mexico to the City of Oaxaca, for instance, and *vice versa*, costs now one per cent. each way, and when money is required to be sent to smaller places, the expenses are much higher, as it is necessary to send a man to the nearest town where the money can be placed by the banks, and pay to him a large commission—the expenses sometimes reaching from five to ten per cent. To keep up this rate of exchange the National Bank makes its bills payable at a certain place so that they cannot be paid at any other.

Banking is very profitable in Mexico. The following is a statement of the earnings and dividends of the National Bank of Mexico, with a capital of $3,000,000, which is owned almost exclusively by Mexicans, and is the fiscal agent of the government:

	NET PROFITS.	DIVIDENDS, PER CENT.
1891	$1,813,623	23
1892	1,839,418	23
1893	2,355,464	29
1894	1,961,801	24
1895	2,200,626	27

The following is a statement from official sources of the earnings and dividends of the Bank of London and Mexico. Up to 1891 it had a capital of $1,500,000, which was then increased to $3,000,000.

	NET PROFITS.	DIVIDENDS EARNED, PER CENT.	DIVIDENDS DECLARED, PER CENT.
1889	$243,246	16	10
1890	569,351	36	20
1891	703,522	46	20
1892	789,967	26	16
1893	618,653	20½	16
1894	603,178	20	14
1895	557,710	18½	14

A few weeks ago it was decided to increase the stock of this bank. The surplus, which amounted to $2,000,000, in round numbers, was divided into stock and issued to the regular shareholders as a stock dividend. Then $5,000,000 of stock was offered to the public. The subscriptions amounted to $22,000,000 or $17,000,000 more than was wanted.

From this short statement it will be seen what a great future banking enterprises have in Mexico.

PUBLIC DEBT.

Our debt is divided into several categories—one contracted in Europe and payable, both principal and interest, in gold; and the debt contracted at home, including the railway subsidies, which foot a considerable amount, its principal and interest being payable in silver. The following is a statement of both the gold and silver debt of Mexico:

The foreign debt payable in gold had four issues, as follows:

1. Issued in 1888.—Bonds for $52,500,000, principal and interest at 6 per cent., to fund the old debt contracted in 1826.

2. Issued in 1890.—Bonds for $30,000,000, principal and interest at 6 per cent., to pay railway subsidies.

3. Issued in 1893.—Bonds for $15,000,000, principal and interest at 5 per cent., to build the Tehuantepec railway.

4. Issue in 1894 was for $13,500,000, principal and interest at 5 per cent., payable in gold.

The four issues of the foreign debt of Mexico amounted to $111,000,000, but having paid a portion of it, the debt was reduced on June 30th, 1896, to	$109,087,500.00
The interior or silver debt has the following issues:	
Three per cent. bonds of consolidated debt in circulation June 30, 1894	34,214,750.00
Bonds for subventions to railroads and harbors	37,596,585.22
Credits liquidated against the Treasury and certificates of amounts due; that is, debts secured by special Government revenue, taxes, imports and other certificates of amounts due	13,373,966.80
Due Banco Hypothecario, guaranteed by the mortgage on Government buildings	998,930.61
Advances from lessees of mints, bearing no interest.	706,282.30
Accounts current and Treasury warrants	7,175,012.91
	$203,153,027.84

I understand that the last four items have been funded in bonds, so that the whole debt of the Mexican Government is now the one held in Europe for $109,087,500, and the silver, or the interior debt, the exact amount of which I do not know.

CONCLUSION.

I am sorry to say that I had not the time and the necessary data at my disposal to write a more complete and interesting paper on Mexico, but I hope that the present article may at least give a general and superficial idea of the country and promote a desire to read other papers and books treating the subject in an abler and more complete manner.

M. ROMERO.

WASHINGTON, DECEMBER 1ST, 1896.

THE UTMOST WATERS OF THE MISSOURI RIVER.

(WITH CHART.)

At the crest of the Rocky Mountains on the southern border of the State of Montana, where the longest branch of the Missouri River takes its rise, the locality is essentially volcanic in its nature, but the eruptive forces have long since ceased to exist there, leaving crater walls and a serrated crest.

The *caldera*, the formation of which seems to have been superinduced by volcanic action, is double in its nature; one amphitheatrical depression, radiating outward at the upper extremity of Culver's Cañon, being situated in its entirety in the State of Montana, causing a thumb-like projection, as shown on the accompanying chart, while apparently a more modern extinct crater, of formidable extent, is situated across the continental divide immediately to the northward, all of which is within the territorial limits of the State of Idaho, and therefore not shown on the chart; the summits between the two constituting a portion of the continental divide and the State boundary, the crest of the Rocky Mountains.* Melting snows, and a limited rain-fall in the summer season, saturate the rugged and precipitous mountains to such an extent that secancy prevailed centuries ago, when small mountain lakes and cataracts gave place for the escarpments which now characterize the Cañon to its mouth, where Hanson Mountain was long since severed apart from Upham Peak, below which a detrital mass has accumulated out upon the plain at the Alaska Basin, in such quantities that the opposite side of the mesa is a depression, toward which the separated currents flow with constant rapidity, augmented by the addition contributed from several smaller affluents; all uniting in one stream-bed, forming a considerable river as it descends into the Upper Red Rock Lake and thence westward through the Centennial Valley and to the parent river beyond.

The channel distances have been very carefully considered and all authorities available consulted, with the result that the longest continuous unbroken current of running water in the world, taking its rise near the crest of the Rocky Mountains in the upper portion of Culver's Cañon, State of Montana, thence flowing westwardly and northwardly through valleys that formerly constituted glacial lake beds, the stream, variously designated as Red Rock River, Beaver Head River, and the Jefferson Fork, passes the mouths of the Madison and Gallatin rivers, and flows into the Mississippi above the City of St. Louis.

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* United States Statutes at Large, 1863–5, XIII, pp. 85–6.

From the upper end of Culver's Cañon to the southwest pass at the Delta of the Mississippi, along the thread of the channel, the distance is as follows:

Crest of Rocky Mountains to Three Forks	398	miles.
Three Forks to confluence with the Mississippi	2,547	"
Mouth of the Missouri to Gulf of Mexico	1,276	"
Total	4,221	miles.

(The channel distance from Nicollets Infant Mississippi above Itasca Lake to the Gulf is 2,553 miles.)

On the 8th day of August, 1872, Professors Frank H. Bradley and W. R. Taggart, members of the Snake River Division of the Geological Survey of the Territories, under F. V. Hayden, ascended to the summit of Sawtell Peak, sometimes called Jefferson Mountain, overlooking the volcanic craters and Culver's Cañon, but they make no mention of the utmost waters of the Missouri, and their cartographer, Mr. Gustavus R. Bechler, omits the stream from his map. They passed no farther to the westward at that point, and since Sawtell Peak stands wholly in Idaho, it is fair to presume that they did not explore Culver's Cañon or ascertain the importance of the stream there situated. On the 27th of August in the same year, Dr. A. C. Peale, Mr. Henry Gannett, Mr. W. H. Holmes and Mr. Joseph Savage explored Red Rock Pass and the upper extremity of the Centennial Valley, as far as Upper Red Rock Lake. Mr. Harry Redfield, in 1891, conducted the planimetric survey for the Government at the Centennial Valley and the Alaska Basin.

No mention is made by either of these gentlemen of the stream in Culver's Cañon or of its geographical importance.

On the 5th and 29th of August, 1895, with Mr. W. N. Culver, the writer explored the principal stream from the Alaska Basin to and up through Culver's Cañon, experiencing great difficulties and hardship in ascending the stream to the *caldera* where it takes its rise. We found no signs of man's presence before us, except an old Indian trail and the site of an old Indian camp near Lillian Lake, where trees had been hacked down in characteristic aboriginal fashion.

Returning to the Centennial Valley in June of the present year, the writer spent many weeks, with the assistance of Messrs. James Blair, William N. Culver and Henry Hackett, in thorough explorations of the entire locality, during which the boundary line between Montana and Idaho was systematically traced along the crest of the mountains, with the peculiar results noted on the accompanying chart.

The gentlemen who aided me are entitled to the credit of making my efforts successful, so far as the same may be considered so.

The reconnoissance which resulted in placing stone monuments on the State line was principally conducted on snow-capped peaks, where several hundred snow-slides had occurred recently, and during the latter part of June of the present year we encountered snow often twenty and thirty feet deep, and the ice in Blair Lake was solid and greenish-blue in color at that time, as witnessed from the rocky peaks overlooking that picturesque and rugged locality.

With the assistance of Mr. Blair and his remarkably trained pack animals, the ascent of Burnside Mountain was accomplished, beyond which we were unable to pass with horses, on account of the tremendous drifts of snow. We established our camp on a summit of ground resembling a very small prairie, picketed our horses, and made all necessary preparations to proceed on foot the next morning from the head of Horse Camp Creek. Here were old signs indicating that buffalo and Indians had been in the habit of crossing Burnside Mountain and the main range, but their trails no longer indicate the activities of the chase.

Leaving our camp early the next morning, we proceeded on foot over the snow and rocky peaks on the State line, establishing landmarks to the summit of Blair Mountain, an immense pile of nature's accumulation, standing one-fourth in Montana and three-fourths in Idaho.

The following week a camp was established above Hanson Mountain in Culver's Cañon, from which we again proceeded on foot up the main stream to the *caldera* and across the divide to the volcanic crater walls east of the Crater Peak, often passing dangerous localities, where the plunging waters of the stream were bridged with decaying ice, affording the only necessary passageway on foot. At the summit of the walls on the State line, and overlooking the source of the Missouri below, another stone monument was erected.

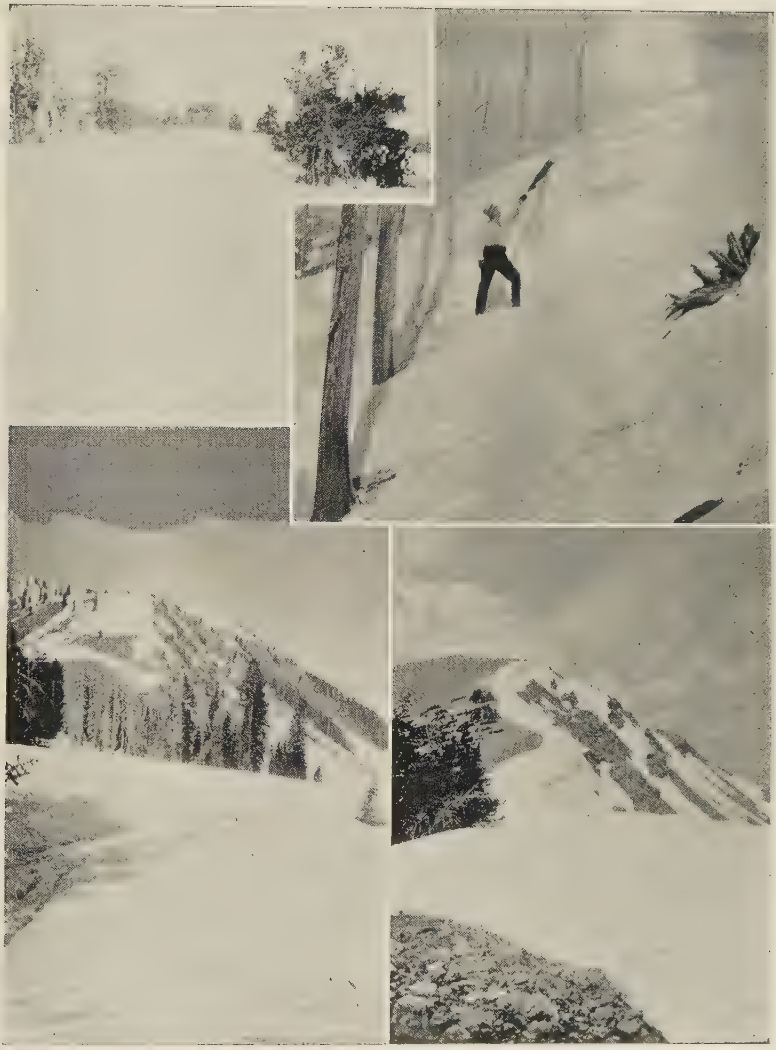
From every snow-bank along the course of our exploration—and there were thousands of them—a little streamlet thence proceeded downward, under the rays of a summer's sun, to the lowest depressions of Culver's Cañon, where, uniting, the consequences incident to the birth of a plunging mountain stream were witnessed on every hand. Every declivity and each crevice of the massive mountains gave forth its contribution to the swollen river, over which we effected our crossings with much difficulty. These explorations were continued until every important locality had been examined, and for the purpose of a convenient geographical reference upon the chart, names for several localities have been carefully chosen, with an attempt to appropriately designate characteristic features or historic occurrences, following the similarity of the course adopted at the utmost source of the Mississippi.

Geographic Names.

A portion of the names on the chart and their origination are as follows:

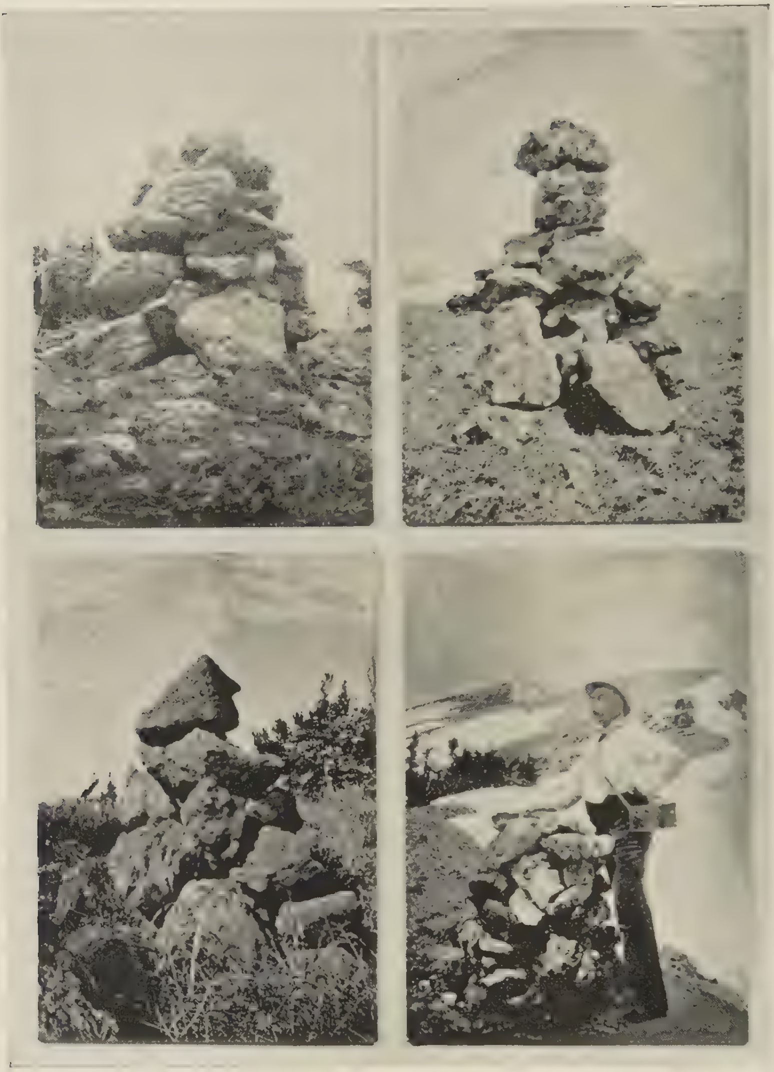
Centennial Valley	First settler in 1876, the Centennial year.
Alaska Basin	Name probably suggested by deep snows.
Red Rock Lakes	After a Red Butte in Beaver Head Co., Montana, which constitutes a prominent landmark.
Shambow Pass	After a prominent citizen.
Peale Mountain	In honor of Dr. A. C. Peale.
Preacher Peaks	After an unknown missionary who first ascended them, from necessity, having reached a point from which he could not descend the precipitous range.
Burnside Mountain	After Mr. and Mrs. S. B. Burnside, of Monida, Montana.
Hanson Mountain	After Mr. Frederick I. Hanson.
Culver's Cañon	After Mr. Wm. N. Culver.
Blair Lake and Mountain	After Mr. James Blair.
Bishops Pass	After prospectors, Sept., 1895, when gold was discovered in Culver's Cañon.
Lillian Lake	After the first lady tourist, Sept., 1895.
Shangle Peak	After the second lady tourist, July, 1896.
Lode Peak	After a discovery of quartz.
Upham Peak	After the distinguished gentleman and author, Prof. Warren Upham.
Monida Peak	In Montana and Idaho, on the State boundary.
Horse Thief Butte, Skeleton Creek.	After a fatal tragedy at that point, when several persons were shot.
Horse Camp Creek	After an encampment of herders.
Swan Lake	A nesting place each year for white swans.
Metzel Creek	After Mr. W. O. Metzel, owner of stock range.

A proposition in writing, suggesting that the volcanic formation and the pass at the head of Culver's Cañon, be named in honor of



TREETOPS ABOVE THE SNOW. A MOUNTAIN SNOWBANK.
AT THE CALDERA, SOURCE OF THE MISSOURI. ON THE STATE LINE, CRATER WALLS.

SNOW SCENES IN THE ROCKY MOUNTAINS.
JUNE 23rd, 1896.



STONE MONUMENTS, MONTANA STATE LINE.

ERECTED IN JUNE, 1896, BY J. V. BROWER AND JAMES BLAIR, AT THE SUMMITS ABOVE THE UTMOST SOURCE OF THE MISSOURI RIVER, ON THE STATE BOUNDARY BETWEEN MONTANA AND IDAHO.

the writer, was not favorably considered,* and after mature deliberation I have arrived at the conclusion that the proper geographical designation is that the longest headwater branch of the Missouri River takes its rise in Culver's Cañon, Montana, 4,221 miles from the Gulf of Mexico and 8,000 feet above the sea.

J. V. BROWER.

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* Messrs. Blair and Culver have designated one of the principal features of the locality "Brower Peak" after the chief of the exploring party, to which there need be no serious objection, as that action does not in any way affect the proper geographical designation of the utmost source of the Missouri.

RECORD OF GEOGRAPHICAL PROGRESS.

NORTH AMERICA.

Gold in the Yukon Region of Alaska.—A Geological Survey party, in charge of Mr. J. E. Spurr, made a reconnoissance of the gold resources of the Upper Yukon in Alaska, last summer, crossing the Chilkoot Pass about June 15 to the upper part of the river and travelling down stream to Forty Mile Creek, Birch Creek and other gold-bearing localities which were carefully explored. The expedition was able to determine the place of the gold-bearing rocks from which is derived the gold found in the river gravels. These rocks form a broad belt running northwest into Alaska from British territory. Schists and gneisses, with intrusive rocks, constitute their lower portions, upon which altered sedimentary rocks rest. Carboniferous and younger rocks overlie them on both sides of the belt, proving that the gold-bearing rocks are older than the carboniferous. The gold in this belt occurs partly in quartz veins and partly in deposits formed along shear-zones. Mr. Spurr described the results of this expedition before the Geological Society in Washington on Nov. 11.

Kafir Instead of Indian Corn.—The settlers in western Kansas, northern Texas, and the Indian Territory found by bitter experience that they could not depend upon raising crops of Indian corn to fatten their stock owing to the semi-arid conditions. A great many farmers in Kansas abandoned their farms on this account. A substitute for Indian corn, that will thrive under the climatic conditions, has been found and bids fair to have an important influence upon the development of that vast region. Kafir corn, which is largely raised in some parts of Africa, yields well in our semi-arid belt where it has now become a staple crop. It nearly or quite equals Indian corn as food for stock, and, though there is little demand for it in the markets, it commands as good a price as Indian corn when converted into pork, beef or draught animals. This is a striking instance of the adaptation of products to environment. Experimentation that has resulted so successfully as in this case shows the usefulness of the new division of our Department of Agriculture, the Division of Biological Survey which, under the direction of Dr. C. Hart Merriam, is now studying the geographical distribution of plants and animals, and their adaptation to the various sections of our territory. A natural outcome of this work will be the introduction of new species of economic plants from abroad in parts of the United States where the climate and soil are particularly adapted for them.

TRADE OF THE UPPER YUKON.—Mr. Alexander Begg, describing the Yukon country (*Scot. Geog. Mag.*, Nov., 1896), many of his facts being derived from Mr. Albert McKay, of the Canadian Land Survey, says the towns in the upper Yukon region, Forty Mile City, Fort Cudahy and Circle City, are mining and trading camps. The North American Trading and Transportation Company, established in 1892, does a very large business and has a large establishment at Cudahy, which is three-fourths of a mile across the creek from Forty Mile City. The company's steamer plies on the river. The Alaska Commercial Company has an extensive establishment at Forty Mile City and two steamers on the Yukon, and each company is building another steamer for next year's trade. They do a very large business with the miners, and are unable as yet to supply the demand. The Alaska Commercial Company does the larger part of the business. It sold out all its supplies before winter fairly began in 1895, and had to buy $30,000 worth of merchandise from the other company. The two companies sold last year about $680,000 worth of goods to miners and others in the district from Forty Mile to Circle City. The currency is mostly gold dust taken at $17 an ounce. Mr. Ogilvie, Chief Dominion Surveyor, asserts that before many years agriculture, to some extent, may be successfully carried on in this region. Another writer says of Forty Mile City: "The price of restaurant board is $12 a week and whiskey is fifty cents a glass over the bar. The town is an ideal '49 camp; its saloons, gambling houses, concert halls, etc., give it an air of bustling activity, from which, however, the element of lawlessness is almost entirely eliminated. Miners' law prevails, and justice is fairly and impartially administered."

NEW DISTRICTS IN CANADA.—The Statistical Year Book of Canada gives the boundaries of the provisional districts into which the northern part of the Dominion has been divided. (1) The District of *Ungava*, bounded north by Hudson Strait, south by Quebec province, east by the Dependency of Newfoundland on the Labrador coast, and west by Hudson Bay and Ontario, all islands within three miles of the coast included. (2) *Franklin* includes all the

Arctic islands from Baffin Bay, Smith Sound and Robeson Channel on the east to Banks Land and Prince Patrick Land on the west, the south boundary running from Cape Best through Hudson Strait, Fox Channel, the Gulf of Boothia, Franklin, Ross and Simpson Straits, Dease Channel and Dolphin and Union Strait. (3) *Yukon*, bounded west by Alaska, south by British Columbia, and east by a line drawn through the west mouth of the Mackenzie River along the 136th meridian to the range of mountains north of the Pelly River and then along the range to the Liard River on the British Columbian boundary. (4) *Mackenzie*, extending from the Yukon district eastward to the 110th meridian and southward to British Columbia and Athabasca. It is proposed to add to Athabasca the territory north of Saskatchewan as far east as the 100th meridian. The district of *Keewatin*, which has been indicated on the maps for some years, lies between the 100th meridian and the west coast of Hudson Bay, and is now extended to the northern edge of the continent by adding a territory embracing about 470,000 square miles.

Canada has thus divided into five districts all the parts of her possessions not previously defined, and has included in them the Arctic regions of Grinnell Island, discovered and named on Sept. 21, 1850, by the first Grinnell expedition, in honor of Mr. Henry Grinnell, the first president of the American Geographical Society, who equipped and despatched the expedition to aid in the search for Sir John Franklin; also Grinnell Land, named in 1853 by Kane, who explored its coast to Carl Ritter Bay; also Grant Land, its northern extension, named by Dr. Bessels of the Polaris expedition of 1871–73.

TIDES OF THE BAY OF FUNDY.—The rise and fall of the tide in the Bay of Fundy are not found, upon careful examination, to be quite so excessive as we were taught at school to believe, though they are remarkable. Mr. Chalmers reports (Geolog. Surv. of Canada, 1894, Report M), that the bay is 48 miles wide at its mouth, and the bottom, which there is 70 to 110 fathoms deep, rises at an average rate of four feet a mile all the way to the head of the bay. On the coasts, just outside the mouth of the bay, the spring tides vary from 12 to 18 feet. Within the bay the greatest tidal oscillations are at Noel River, where the spring tide rises 53 feet and the neap tide 31 feet.

THE NEW YORK STATE FOREST RESERVATION.—The defeat of the forestry amendment to the Constitution of New York State in the November election was a cause of gratification to all who are interested in the forest preserve in the Adirondacks. It was proposed by the amendment to permit the lease, exchange or sale of small parts of the reservation, and the amendment seemed designed chiefly for the benefit of those who desire to maintain summer houses among these primeval forests. There are scientific and other reasons why the integrity of the Reservation should be preserved.

SOUTH AMERICA.

EXPEDITION TO THE CHILIAN ANDES.—Mr. E. A. FitzGerald, who recently returned to England from his explorations in the New Zealand Alps, has started, according to *The Geographical Journal*, for the Chilian Andes, his main purpose being to ascend Aconcagua, the highest summit of South America. There are ten persons in the party, including Mr. Vine, geologist, Mr. de Trafford, surveyor, and Mr. Gosse, naturalist. From Buenos Aires the party will go to Mendoza, and will thence make straight for Aconcagua, which will be ascended in a leisurely fashion so as to give ample time for scientific work. The explorer's object is to watch the effect of the various altitudes on the system with a view to still higher climbs among Himalayan peaks. It is to be expected that the party will succeed in settling the question of the origin of the mountain. Such recent writers as Reclus and Sievers leave this question open, though there is little doubt that Aconcagua is of volcanic origin.

ARGENTINE EXPLORATIONS.—Dr. Polakowsky writes in *Petermanns Mitteilungen* (1896, No. 9), that the series of explorations begun in 1894 along the Bolivian frontier under the direction of Dr. F. P. Moreno, director of the Museo de La Plata, and continued during the past year in the districts bordering the southern part of the Andes, has been completed. The various parties travelled over 25,000 miles. The collections fill 400 chests, and 2,000 photographs were taken. The little-known territories of Neuquen, Rio Negro and Chubut have been carefully surveyed. Eight new lakes have been discovered north of Lake Nahuel Huapi and fifteen south of it. The Rio Teteleufu, whose course was not known, has been explored from its source, and much of the way it has a depth of 25 feet. Dr. Moreno is convinced that nothing but a railroad from the east coast to the neighborhood of Lake Nahuel Huapi is needed to assure that fertile and beautiful region an excellent future.

Population of the Argentine Republic.—*Petermanns Mitteilungen* for October contains the results of the second census of the Argentine Republic, made in May, 1895. The results by provinces and territories are as follows:

PROVINCES AND TERRITORIES.	POPULATION.	INCREASE PER CENT. PER ANNUM SINCE THE FIRST CENSUS (SEPT. 1869).	PROVINCES AND TERRITORIES.	POPULATION.	INCREASE PER CENT. PER ANNUM SINCE THE FIRST CENSUS (SEPT. 1869).
Buenos Aires :					
Capital	663,854	9.9	Prov. Jujuy	49,543	0.9
Province	921,225	7.8	Prov. Salta	118,138	1.3
Terr. Misiones	33,005	...	Prov. Tucuman	215,693	3.8
Prov. Corrientes	239,570	3.3	Prov. Catamarca	90,187	0.5
Prov. Entre Rios	290,994	4.5	Prov. La Rioja	69,228	1.6
Terr. Formosa	4,829	...	Prov. San Juan	84,251	1.5
Terr. Chaco	10,280	...	Prov. Mendoza	116,698	3.1
Prov. Santa Fé	397,285	13.4	Terr. Neuquen	14,517	...
Prov. Santiago	160,445	0.8	Terr. Rio Negro	9,300	...
Prov. Córdoba	351,745	2.6	Terr. Chubut	3,748	...
Prov. San Luis	81,155	2.0	Terr. Santa Cruz	1,058	...
Terr. Pampa	25,765	...	Terr. Tierra del Fuego	477	...

The total population, including estimates of 60,000 unenumerated and 30,000 Indians, is given at 4,043,000. The most rapid increase occurs in the province of Santa Fé, and is due to the large extension of agriculture there, chiefly wheat-raising. Fifteen towns, besides the capital, have a population of over 10,000, viz.: Rosario, 92,442; La Plata, 43,565; Córdoba, 42,783; Tucuman, 34,297; Mendoza, 28,803; Paraná, 23,922; Santa Fé, 23,818; Salta, 16,672; Corrientes, 16,058; Chivilcoy, 14,632; Gualeguaychu, 13,003; Concordia, 12,449; San Nicolás, 12,281; San Juan, 10,410; Barracas al Sur, 10,185.

Chili's New Treaty with Bolivia.—Telegraphic information received concerning the new treaty between Chili and Bolivia concluded on May 1, briefly reported that in accordance with the truce of 1884, Bolivia cedes to Chili the whole of the province of Antofagasta. Bolivia appears therefore to be permanently deprived of a seaport.

EUROPE.

Erosion of English Coasts.—A report to the British Association (1895) shows that for 37 years the clay coast of Yorkshire, from Bridlington to Spurn Head, has had an average annual recession of 5 feet 10 inches. Drifting shingle is caught by the piers at Dover and Folkestone, and thus the cliffs beyond are deprived of their natural protection.

THE NANSEN RESEARCH FUND.—The London *Times* says a fund is raising in Norway to commemorate Nansen's Arctic expedition. It is to be known as "The Fridtjof Nansen Fund" for scientific research, the income to be devoted to the promotion of science in various departments and the publication of the results. The fund will probably be under the care of the Christiania University, the Norwegian Society of Science and the Bergen Museum. Over 300,000 kroner (about $81,000) have thus far been subscribed. Contributors to the fund may communicate with the Committee, University of Christiania.

THE IRON GATES OF THE DANUBE.—The formal opening of the Danube Ship Canal at the Iron Gates (BULLETIN, 1896, No. 2, p. 162), occurred on Sept. 27 last. Dr. K. Peucker, of Vienna, has written a very clear statement of the nature of this work (*The Geographical Journal*, Dec., 1896), which has opened the upper Danube to vessels of considerable size. The main object was to clear some fifty miles of the rapids and shallows obstructing the river, and particularly to cut a clear channel, 200 feet wide and 10 feet deep, through five dikes crossing the river-bed. These dikes had to be blasted with dynamite. The obstacles at the Izlaz-Tachtalia rocks were circumvented by a canal and dam giving the Danube a new right bank for four miles and narrowing its bed from 6,500 to 1,000 feet. A canal was also cut around the largest rock shoal at the Iron Gate proper. On the Prigrada bank in the river, the workmen found the remains of two very large unfinished dams erected by Trajan to confine the waters of a canal. There remain a few obstacles below the Iron Gates which it is hoped to remove by the end of 1898.

AFRICA.

NATURAL HISTORY EXPEDITION IN SOMALILAND.—Prof. D. G. Elliot, of the Field Columbian Museum of Chicago, and his assistant, Mr. C. E. Akeby, returned to this country in November, after a very successful expedition into Somaliland, whither they went in March last to make a natural history collection for the museum. Fifty-eight cases and barrels of specimens were shipped from Aden to Chicago. The collections were chiefly of the large mammals, but over 300 specimens of birds, fish, insects and reptiles were also obtained.

AGRICULTURAL EXPERIMENT STATION.—The Germans in East Africa are following approved methods in studying the resources and capabilities of their territory. They have established an agricultural experiment station among the Usambara Mountains, which border the interior plateau and separate it from the coastal plain, the mountains being 75 to 100 miles from the Indian Ocean. This mountain region is comparatively healthful. Here the Germans are testing both native and introduced tropical plants at different altitudes to decide which are best suited for cultivation among these comparatively fertile mountain valleys; and when these points are determined, plants and seeds will be supplied for the plantations already opening there.

THE EAST AFRICA PROTECTORATE.—The London *Gazette*, of Sept. 1, announces that all the territory in East Africa, under the protectorate of Great Britain, except the islands of Zanzibar and Pemba and the Uganda Protectorate, are now included in one administration known as the East Africa Protectorate. This is the vast district extending from the Indian Ocean to the Uganda Protectorate, that has been known for some years as Ibea, and it includes all the islands near the coast between the Jub and the Umba Rivers. The Uganda Protectorate has been extended so as to include the territory of Unyoro, north of Uganda, and districts west of these two regions, and the Protectorate, therefore, now embraces the country northward to the Victoria Nile and westward to Lakes Albert and Albert Edward, and includes the greater part of the Ruwenzori range and the lower part of the Semliki Valley.

THE FRENCH RAILROAD TO THE NIGER.—The French Government has decided to complete its railroad from the upper Senegal to the Niger. Starting at Kayes, the point on the upper river reached by steamboats from the Atlantic Coast, it was completed as far east as Bafulabe in 1888. The extension to Bammaku on the Upper Niger has now begun, and a bridge has been built over the Bafing near its junction with the Bakhoi. (*Bulletin du Comité de l'Afrique Française, Nov., 1896.*)

ASIA.

DIVERTING THE AMU-DARIA TO THE CASPIAN.—The Russian Government has sent Gen. Glukhowsky to the Amu-daria (Oxus River) to make further researches as to the possibility of connecting the river with the Caspian by a canal which, if feasible, would add much to the transportation facilities of that region. This renewed exploration was incited by the fact that, some time before the coronation of the Czar, the Amu-daria began again to send a part of its waters into the Uzboi, which is asserted by some writers to be the channel through which the Amu-daria formerly flowed to the Caspian. The reason for the present partial discharge into the Uzboi appears to be the destruction of a dam in the Khanate of Khiva. By means of this dam all the waters had been directed into Lake Aral.

THE UPPER YANGTSE RIVER.—The *Comptes Rendus* of the Paris Geographical Society (1896, pp. 234–250) reports a surprising and important discovery made by M. Bonin while travelling between the Upper Yangtse-Kiang and its tributary, the Yalung-Kiang. The Kinsha River is represented on the maps as the Yangtse itself, the Upper Yangtse being shown in South-East Tibet as the Di-chu and in West China as the Kinsha. But M. Bonin, the first European to visit the town of Li-Kiang-fu, discovered that a little below the sharp angle made by the Kinsha near that town it makes a wide sweep to the north and joins the Yalung in about 28° N. lat., some 85 geographical miles north of the point of junction indicated on the map. The Kinsha, instead of being the Yangtse, therefore, appears to be a tributary of the Yalung affluent of the great river, and the Yangtse, properly so called, begins in Western China, while receiving through the Yalung tributary waters from Tibet. Mr. Hosie crossed the Kinsha, which he supposed to be the Yangtse, in 1883. All these river courses in China derive their present delineation from D'Anville's map, whose author was compelled to rely, for this region, chiefly upon vague report. M. Bonin does not appear to have followed the Kinsha continuously in its northern sweep, and *The Geographical Journal* (Nov., 1896, p. 515) raises the query whether a bifurcation (a channel joining two rivers) may not here unite the Kinsha and the Yalung, such as was hinted at in a neighboring region by Garnier.

VARIATIONS IN THE LAKE DISTRICT OF LOB-NOR.—The studies of Dr. Sven Hedin in the region of Lob-nor, in central Asia, seem to clear up the mystery attached to it and will put an end to further controversy. Hedin has visited both the region where the Chinese geographers placed Lob-nor, and also the district a little further south, where Prjevalsky placed the lake in the position it occupies on our maps. He contributes to *Petermanns Mitteilungen* (No 9, 1896) a series of nine maps to illustrate the changes that have taken place, or, in some cases, have probably taken place, in the position of the reservoirs that have received the waters of the Tarim, the Konche-daria and the Cherchen-daria. He says the basin of the Tarim is like a spoon, the deeper end towards the east, surrounded on all sides except the east by mountain ranges, from which flow rivers, most of which disappear in the sands before they reach the main river. Dust and sand are driven west by the prevailing east winds, and are spread over the surface in this lake region. The Tarim and the other rivers also bring down considerable matter in suspension, and the mud is deposited in the reservoir district. The result is that this region where the waters accumulate is now practically on a dead level, and it requires only the formation of sand dunes or mud-flats a little above the general level to change the position of the main water receptacle, which seems to oscillate to the north and then back to the south. The two large lakes which formed the Lob-nor of Prjevalsky (1876–1885) were represented at the time of Dr. Hedin's visit in April, 1896, by narrow basins, in which the water was eight inches deep, with a considerable extent of marsh, while the main body of water was further north. The marshes are very salt, and the lakes at low water are a little brackish, but, considering the fact that they are constantly changing their position, it is not surprising that at flood time, when the lakes are comparatively large, the water in them is quite fresh.

THE POLAR REGIONS.

MR. JACKSON'S WORK IN FRANZ JOSEF LAND.—The progress of the Jackson-Harmsworth Polar expedition in the season of 1895–96 is described by Mr. Arthur M. Brice in a valuable paper printed in *The Geographical Journal* for December. On July 11, 1895, Mr. Jackson started along the south-west side of Franz Josef Land to survey the coast line and discover, if possible, any new land to the westward. He travelled in a whale boat with five comrades and a month's provisions. He reached Cape Neale on the 22d and from its summit Jackson distinguished high land bearing west of the farthest point previously seen. On the 28th he sailed across Cambridge Bay to the south-west coast of this land which he named Alexandra Land. He has a theory that it is the southern part of the long-sought Gilies Land. He skirted this coast for about 30 miles to a very imposing cape. At the base of this headland was a vertical face of ice 30 feet high; then steep ice-covered talus arose to the rocks 700 feet above on which rested the ice-cap, rising to an elevation of 2,000 feet. Jackson named this promontory Cape Mary Harmsworth. A terrible gale blew the boat fifty miles off the land towards the south-east and it was impossible to renew work in that direction. He regained his camp at Elmwood on Aug. 12, having advanced Franz Josef Land a considerable distance westward of the previously known limit and being the first to reach and ascend parts of the coast which Mr. Leigh Smith, in 1880 and 1881, saw from his steamer *Eira*, at a distance.

On March 18, 1896, Jackson, Armitage and the sailor Blomvist started on a journey north with seven sledges drawn by a pony and sixteen dogs. They were able to march rapidly and in seven days were near the 81st parallel. They camped on March 26 near a cape 700 feet high to which Jackson gave the name of Richthofen and, next day, from the top of the cape, they saw a large open sea stretching before them, almost wholly free from ice. The explorer named it Queen Victoria Sea. Islands were seen to the north-east and north-west and, far away to the north, was an island which Jackson thought might prove to be the King Oscar Land of Payer. In the previous year Jackson had visited the same place, but thick fog and snow had obscured the sea and he saw only a long stretch of bay ice. This discovery confirmed Jackson's belief, the result of his work in 1894–95, that the Franz Josef Land archipelago does not extend far northward. We now know that the *Fram's* drift past these islands on the north without seeing land establishes this fact.

For two years Jackson has found the ice packed against the land in August and September, while in June and July there is an open sea and he believes the latter months are best for navigating in these waters. Mr. Jackson has seen very few glaciers of large extent or of the common type. An ice-cap crowns nearly all the islands, but seldom descends to the sea, and Jackson records only one instance of a glacier projecting well out into the sea. This glacier, on the south-east coast of Hooker Island launches flat-topped bergs. All the bergs are low, the highest not exceeding 75 feet. The ice-cap and inland glaciers show little sign of movement, though the angle of slope is often 15°. Their surface is smooth and crevasses are few. The remarkable glacier faces which Peary found in north-west Greenland, showing many minute layers exhibiting stratification with some folding and false bedding, have also been discovered in Franz Josef Land. The ice-cap varies from a few to a thousand feet in thickness. Bruce Island, for instance, is capped with ice.

Its rocks only appear at intervals at the level of the shore-line and its coast is nothing else than the face of the ice-cap; but some islands are found quite free from ice. Mr. Brice's paper is supplemented by a valuable report on the flora of the archipelago by Mr. Fisher, the botanist of the expedition.

LIEUT. PAYER'S MAP OF FRANZ JOSEF LAND.—Dr. Nansen reported, on his return, that he had failed to identify, while in Franz Josef Land, a single geographical feature discovered by the Austrian explorer Payer, and that Payer's map of the northern part of Austria Sound was certainly all wrong. In August, last year, between the day when he first reached the coast of Franz Josef Land and the time when he attained the place of his winter camp, he crossed, according to his determination, Payer's sledge tracks without finding any agreement with his map. Mr. Jackson, further west, also reports his inability to reconcile his discoveries with the long existing map of Franz Josef Land. It will be impossible to judge accurately of the alleged imperfections of Payer's map until all the data collected by Nansen and Jackson are made public. Prof. Copeland says (*Nature*, Nov. 12) that there is no doubt of the accuracy of the southern part of Payer's map, the latitudes and longitudes of the Austrian exploring steamer *Tegetthoff* in the land ice and of certain points on the neighboring coast having all the precision that could be obtained from a long series of meridian altitudes, and no less than 218 lunar distances, combined with systematic triangulation, which were connected with all the neighboring islands within 30 or 40 miles. The satisfactory character of this part of the map was proved by Mr. Leigh Smith. The survey naturally grew less accurate as it was extended up Austria Sound. The latitudes, however, must have been near the truth, as they were based on numerous meridian altitudes of the sun, and fortunately an observation was secured in 81° 57′ N. lat., within a few miles of the most northern point Payer reached. His longitudes, however, for his sledge journey, seem to be considerably out of the way. He depended solely on compass azimuths or bearings taken with a theodolite, often under unfavorable conditions. Exaggerated inferences seem also to have been drawn from the coast lines he saw as to the extent of the country behind them. Lieut. Payer has deposited with the Royal Geographical Society all the materials he used in constructing his map.

THE CORNELL PARTY AT MELVILLE BAY.—Mr. R. S. Tarr has contributed to *Science* a report of the work of his party from Cornell

University which was landed at Nugsuak Peninsula, near the south terminus of the Melville Bay coast, by R. E. Peary, C. E., U. S. N., on Aug. 7 last. The party remained there till Sept. 7. A large glacier at the south-east base of the peninsula, which was named Cornell glacier, is now in rapid retreat, and this is regarded by Mr. Tarr as a part of a general withdrawal of a vast ice-sheet which formerly extended out beyond the Duck islands, 32 miles from the front of the Cornell glacier. Mr. Tarr thinks that the present glaciation in this part of Greenland is a shrunken remnant of a former greater sheet of unknown extension to the west.

MR. ANDRÉE'S BALLOON EXPEDITION.—*The Geographical Journal*, summarizing Mr. S. A. Andrée's report on his balloon expedition to Spitzbergen (*Ymer*, 1896, Häft 3), says that the *Virgo* sailed with his party from Tromsö on June 14, 1896. The steamer called at Isfiord and Norway islands, and on June 23 found a suitable place for erecting the balloon house on Dane's Island. To build the house and land the balloon took nearly a month. The house was ready on July 20; filling the balloon began on July 23, and it was ready for sailing on July 27. But the essential winds from a southerly quarter did not come and, as it was necessary for the ship to go back, the balloon was packed up and started on its return journey on Aug. 20, reaching Göteborg nine days later. There was a feeble southern wind for a few hours only on July 29 and 30 and next on August 2 and 3, which, however, changed in the afternoons to a wind from the north or north-east. As the balloon is now in working order, the cost of a new expedition will not exceed 53,000 kroner, provided next year's party is taken to Spitzbergen on a ship of the Swedish Navy. Mr. Andrée believes the balloon expedition is practicable if everything is ready for the ascent earlier in the summer. There was no lack of favorable winds in the earlier part of the stay at Dane's Island last summer. The expedition at least demonstrated that a balloon may be filled in Spitzbergen.

PROPOSED BELGIAN ANTARCTIC RESEARCH.—Lieut. de Gerlache, of the Belgian Navy, who is organizing and will lead the projected Belgian expedition to the South Polar regions, has informed Reuter's Agency that the expedition will start from Antwerp about the middle of July next. The steamer *Belgica*, which has been engaged, will be specially strengthened for ice navigations and arranged for the convenience of scientific workers. A laboratory will be built on the deck, and she will be provisioned for three years. The expedition will be particularly devoted to geological and zoölogical research, and the staff will include M. Archowsky, Geological Chemist, Lieut. Danco, who will conduct the magnetic and the meteorological work, M. Racovitza, who will have charge of the dredging, and M. Taguin, physician and scientific assistant.

DISTRIBUTION OF ICEBERGS IN ANTARCTICA.—The November Pilot Chart of the North Pacific (U. S. Hydrographic Office) has an account of the chronological and geographical distribution of icebergs in the Southern and Antarctic oceans. The bergs are apparently formed at various points of the Antarctic Continent, and a great many of them drift north and east, and are grouped principally in the vicinity of Cape Horn, the Falkland Islands and an area south of Africa. The Antarctic icebergs are much larger and more compact than those of Arctic origin, and therefore endure longer and drift to lower latitudes, the northern limit of the South Polar bergs differing with the seasons. Two charts are given, one showing the seasonal iceberg limits, and the other, the icebergs reported at different seasons from 1891 to 1895.

OCEANOGRAPHY.

PLANKTON AND HYDROGRAPHY.—It has long been known that the sea abounds in microscopic organisms, both animal and vegetable. Prof. Hensen proposed the name of plankton for these pelagic forms and it has been universally accepted. Prof. P. T. Cleve says (*Nature*, Nov. 26, 1896) that he examined, several years ago, specimens of vegetable plankton collected by Swedish Arctic expeditions as well as samples from various regions in tropical seas, and became convinced that certain parts of the oceans are characterized by different species. On the west coast of Sweden, in 1893, he examined plankton obtained at various depths in water strata of differing temperatures and salinity, and found further that the various strata were characterized by different amounts of plankton and by different species. He has, later, examined a large number of specimens of vegetable plankton, chiefly from the Skager Rak and Kattegat, and, according to the prevailing species, has distinguished four types. (1) The Tripos-plankton prevails in the summer, and in all cases the water containing it seems to be derived both from the North Sea and the Baltic. (2) The Didymus-plankton was predominant in the Skager Rak and Kattegat in November, 1893, filling the fiords from the bottom to the surface, and, with the water containing it, the herring arrived on the shores of Scandinavia. This water apparently drove away the whole of the summer water from bottom to surface, and seems, without doubt, to have come from the southern North Sea, along the west coast of Denmark. (3) The Tricho plankton, a North Atlantic type, found almost pure south of Ireland, but rarely in a pure state on the Scandinavian coast. (4) The Sira-plankton, of Arctic origin, occurring on the Scandinavian coast in February and March. During the last days of June, 1893, the plankton changed in Gullmarsfiord, and with the advent of Entomostraca (animal plankton), mackerel appeared. Prof. Cleve urges that the study of plankton is thus seen to be of great interest both in relation to hydrography and also to meteorology and fishery questions. The close connection between the state of the sea and the movements of the air, and the causes of the migration of fish, may be found to be intimately connected with the change of water containing different kinds of plankton. He emphasizes the importance of a thorough and systematic study of the plankton of the NorthSea.

AUSTRALASIA.

A Pass over the New Zealand Alps.—Mr. E. A. FitzGerald, who has made the first ascent of four peaks in the New Zealand Alps, Mount Tasman (11,475 feet), Mount Sefton (10,350 feet), Mount Haidinger (10,054 feet) and Mount Sealy (8,631 feet), also claims to have discovered a pass of importance to the colony. This great mountain wall has prevented communication between the east and west coasts except by sea and a direct route across the barrier anywhere near the middle of the island was much to be desired. The pass, which now bears Mr. FitzGerald's name, leads directly from one of the branches of the Tasman valley to the west coast. Its discoverer says that with some expenditure in making a track, the pass may be easily crossed by pack-horses and cattle during the summer season. On the other hand, the Report of the Department of Lands and Surveys of New Zealand (1895–96), throws doubt on the availability of this pass. It is 7,180 feet high and the route crosses a snow-field. Mr. Brodrick says that the pass discovered by him in 1890, which is 18 miles from Lake Ohau, is only 5,300 feet high and has been crossed by Mr. D. Matheson with pack-horses.

EDUCATIONAL.

Illustrating Map Projections.—Mr. Andrew J. Herbertson, lecturer on Geography in Owen College, Manchester, says in one of his papers on "Geographical Education" (*Scot. Geog. Mag.*, Nov., 1896): "There is real difficulty for most people, passing from the globe to the map, in understanding how the curved surface is expressed on the flat. After trying many methods, I have devised an apparatus for illustrating projections graphically by throwing the shadow of a skeleton hemisphere on a screen. By modifying the positions of the light and the hemisphere, and by bending the screen into a half cylindrical or conical shape, and then unbending again, after tracing the shadows, various projections can be shown. The making of the net-work of a map on the flat surface in this way is very effective, and also gives an idea of the different distortions made in the earth's surface by various projections."

Like all the best teachers to-day, Mr. Herbertson believes that for map-drawing in schools, mechanical copying is almost wholly waste labor. It is absurd, he says, to expect children to know the exact shape of every country, because the shapes differ according to the map projection used. The maps they draw should be simplified and without political boundaries until the children are in an advanced stage of the study. "Climate and distribution maps of vegetation, animals, man, occupations, etc., should be drawn. A boy who can sketch from memory, in rough outline, a dozen maps showing physical features, the rainy and dry regions, the hot and cold regions, the desert, pasture and forest lands, the sparsely and densely peopled regions, etc., knows far more about geography than the boy who can reproduce the sinuosities of coast and river, and the intricate zigzags of political boundaries."

GEOGRAPHICAL LECTURES.—Columbia University is giving this winter a series of geographical lectures, in co-operation with the American Museum of Natural History. At the first lecture on Dec. 5, Prof James F. Kemp of Columbia spoke of the Rocky Mountains. He limited the term Rocky Mountains to the eastern ranges of the North American Cordilleras, in accordance with the best usage. Beginning at the south in New Mexico, he considered the mountains in the different States, bringing out the topographic features of peaks and parks and showing the relation of the mountains to man in the way of forests, mining, etc.. In every case it was shown that the higher peaks are closely confined to the areas of granitic rocks. In New Mexico few peaks rise above 10,000 feet, but in Colorado many peaks rise to 18,000 feet, and their closely accordant summits present one of the great problems for the modern geographer who would interpret the features of the West. Following north through Montana and Wyoming, the Rocky Mountains may be traced beyond the national boundary, where they become merged with the Cascade and Coast Ranges, so that they are not distinctly separable unless studied closely from a physiographic standpoint.

The second lecture on December 12, by Dr. C. Willard Hayes, of the United States Geological Survey, was on the Mountains of Alaska. He divided the territory into its various physiographic divisions and considered the topography and character of each with some detail. The great interior is known as the Yukon Plateau. It is a much dissected peneplain, four-fifths of which are less than 5,000 feet in altitude. In the south-east are the Rocky Mountains 7,000 to 9,000 feet in altitude, and extending an unknown distance into the territory. West of the Rockies is a small region known as the Cassiar Range, in many ways like the Rockies, but of volcanic origin. Still further east is the Coast Plateau, bordering the coast north to the St. Elias region. It is about eighty miles wide and much dissected by fiords. The precipitation here is excessive and glaciers are numerous. North and west of the St. Elias region is the Chigmit Range, more than 240 miles long and occupying the peninsula of Alaska. The rocks here are mostly volcanic and there are at least ten active volcanoes. The region of the greatest interest is the St. Elias, which is concentric in outline and includes the Alexander and St. Elias Alps and the Wrangel group. The south-western horn of the crescent is the Kenai peninsula. Of the great mountains Mt. Logan is the highest, 19,539 feet in altitude, thus overtopping St. Elias (18,010) by over 1,500 feet. The topography in the St. Elias region is very youthful and the mountains are, therefore, very angular. The snow line is at a very low altitude, and hence the difficulty of ascending the greater peaks for accurate geographical work.

The third lecture was by Mr. Bailey Willis, of the United States Geological Survey, on the Cascade Mountains of the Pacific Coast. Mr. Willis defined the limits of the Cascade as Lassen Peak on the south, and probably Alaska on the north, the mountains extending through Oregon, Washington and British Columbia. The range runs about 100 miles from the coast and parallel to it, and is from 50 to 100 miles broad. The general elevation is 7,000 feet, and many peaks reach 10,000, the highest 14,500 feet. The southern part, extending into southern Washington, is volcanic in origin and of recent date. The northern part is of true mountain character, and contains few rocks of volcanic origin. Three types of topography of volcanic origin are to be seen in the southern portion: (1) The great lava plains of Idaho, eastern Washington and Utah, where lava emerged in a very liquid manner; (2) the great plateau from northern California to southern Washington, 6,000 to 7,000 feet in altitude, where the lava was more viscous; and (3), the more than a score of large volcanic cones, rising in altitude from 9,000 to 14,500 feet. In the northern Cascades the mountains represent the remnants of a peneplain uplifted to 7,000 feet, with many wind gaps cut 3,000 feet into the mass by the long, persistent antecedent rivers. The mountains are now much worn by ice and water, and in their aiguille peaks are a witness of the work of ice to which they have been subjected. Among special features of interest in the Cascades are the volcanic peaks of Rainier (Tacoma), of Shasta and Crater Lake. Crater Lake is the site of a once high volcanic peak termed Mt. Mazama, that has probably sunk into the throat beneath. The lake in this old volcanic crater has nearly vertical walls 2,000 feet high and has a depth of 2,000 feet. In the lake is a small crater of more recent date, known as Wizard Isle. This, too, is an extinct volcanic cone and its crater is occupied by a small lake.

The fourth lecture was given on December 26 by Mr. H. M. Wilson, of the United States Geological Survey. Subject: The Sierra Madre of Mexico.

GEOGRAPHIC AIDS.—Mr. R. E. Dodge, of the Teachers College, New York City, supplies this list of Aids in the Study of Geography, published in this country. He has included some text books which give much attention to physiography:

BOOKS.

Tarr's Elementary Physical Geography. Macmillan. $1.25.

Use of Governmental Maps in Schools. Henry Holt. 30c.

Frye's Primary and Complete Geographies. Ginn & Co.

Frye's Brooks and Brook Basins. Ginn & Co.

National Geographic Monographs. Set $1.50. 20c. each. (1) Physiographic Processes; Powell. (2) Physiographic Features; Powell. (3) Physiographic Regions of the United States; Powell. (4) Present and Extinct Lakes of Nevada; Russell. (5) Beaches and Tidal Marshes of the Atlantic Coast; Shaler. (6) The Northern Appalachians; Willis. (7) Niagara Falls and their History; Gilbert. (8) Mount Shasta, a Typical Volcano; Diller. (9) The Physical Geography of Southern New England; Davis. (10) The Southern Appalachians; Hayes. Nos. 1, 2, 3 and 9 are especially valuable.

Russell. Lakes of North America. Ginn & Co.

Russell. Glaciers of North America. Ginn & Co. (In press.)

Roosevelt. The Winning of the West. 4 vols.

Shaler. Nature and Man in North America. Scribners.

Shaler. Story of our Continent. Ginn & Co.

Whitney. The United States. Little, Brown & Co.

Tarr. The Teacher's Outfit in Physical Geography. (School Review. March and April, 1896.)

Annual Reports of the United States Geological Survey. 12th contains Origin and Nature of Soils, by Shaler; 13th contains Geological History of Harbors, by Shaler; 15th contains Geology of the Common Roads, by Shaler.

History of Individual States in American Commonwealth Series.

MAPS.

See descriptive list in "Use of Governmental Maps in Schools."

Relief Map of United States in Thirteenth Annual Report of the United States Geological Survey.

Geological Map of United States in the Fourteenth Annual Report.

Folios of the United States Geological Survey. 25c. each. Order by Number.

LANTERN SLIDES.

See list to be obtained from E. E. Howell, 612 Seventeenth Street, N. W., Washington, D. C.

MODELS.

Chattanooga District. Published by E. E. Howell. $60.

Vicinity of New York. (Slated.) Ready soon.

This list might be extended to advantage, particularly by the inclusion of some foreign works. We add to it the paper on "Geography from Nature" (BULLETIN AMER. GEOG. SOC., 1896, pp. 146–156), by Mr. Dodge, describing how geographical excursions may be made profitable in the neighborhood of New York City. Mr. Herbertson includes it in his bibliography in the *Scottish Geographical Magazine*, and says: "Teachers may derive many useful hints from this article."

GENERAL.

The Royal Society, of Great Britain, has conferred one of its medals on Sir Archibald Geikie, on the ground that of all British geologists he is the most distinguished, not only as regards the number and importance of the geological papers which he has published as an original investigator, but as one whose educational works on geology have had a most material influence upon the advancement of scientific knowledge.

The expedition sent by the Royal Society to the Ellice Islands to bore through the coral (BULLETIN, No. 3, 1896), for the purpose of learning the nature of the foundation upon which it rests, did not succeed in its mission, the boring apparatus being choked by quicksand.

The Icelandic Earthquake of Aug. 26 last seems to have been clearly indicated in Paris by the magnetograph in the Observatoire du Parc Saint-Maur.

The daily newspapers have printed accounts of the murder of the Austrian geologist Baron von Foullon-Norbeck by the natives of Guadalcanar in the Solomon group, after he had reached Lion Head, a mountain in the interior of the island. He was attached to the staff of the gunboat *Albatross*, which was on a scientific voyage around the world.

WASHINGTON LETTER.

WASHINGTON, DEC. 21, 1896.

MEXICAN BOUNDARY.—Lieut. Col. J. W. Barlow, Corps of Engineers, U. S. A., on behalf of an international commission has made a final report of the resurvey of the boundary line between the United States and Mexico. Under the treaty creating the Commission, its conclusions are binding upon both Governments. Associated with Col. Barlow were Lieut. D. D. Gaillard and A. T. Mosman of the Coast Survey on the part of the United States, and Señores Don Jacobo Blanco, Valentin Gama, and Capt. Caspar Martinez Caballos on the part of Mexico.

The Rio Grande is the boundary from El Paso eastward. The distance from El Paso westward to the Pacific is 700 miles. Along this route 258 iron and stone monuments have been erected at an average of one to every two and one-half miles. In thickly settled districts they are not more than one mile apart. The widest interval is five miles. There are only two monuments throughout the entire distance of 700 miles from which the next one may not be observed. No monuments were set on that part of the boundary formed by the Colorado River, nor along the Rio Grande. These monuments are models of construction and design. They consist of shafts of stone twelve feet high and about six feet in diameter at the base. But where stone was not available, iron columns six feet by two are used. The monuments are bolted to concrete foundations or solid rock. On the face of all is the inscription:

BOUNDARY OF THE UNITED STATES,
Treaty of 1853.
Reëstablished by treaties of 1882–89.

The destruction, displacement or defacement of this monument is a misdemeanor, punishable by the United States or Mexico.

There is a similar Spanish inscription on the Mexican side. Every monument is numbered. No. 1 is two miles west of El Paso, and No. 258 a few yards from the sea, near San Diego, Cal. Some were set in places almost inaccessible. No. 153 is bolted to the crest of the Cerro de la Lesna, a peak in Southern Arizona, with sides almost perpendicular. Nos. 255 and 256, being in a thickly settled section, are handsomely built of granite and marble, surrounded by fences of steel pickets.

In surveying a belt of country three and a half miles wide on each side of the boundary the Commissioners encountered many perils and much suffering from heat, powdery sands and lack of water. While working at Soynota the mean temperature was 126° in the shade, and in crossing the Tule and Yuma deserts the water for men and animals had to be hauled 100 miles.

This work has been prosecuted by an international commission under a treaty concluded between the United States and Mexico July 29, 1882. It ends controversy concerning territorial rights on the Mexican border.

GEOLOGICAL SURVEY.—Mr. Arnold Hague is engaged in the preparation and study of the data and material collected during his nine years of survey in the Yellowstone National Park. The final work on the atlas folio is completed, and the geologic sheets and explanatory text are now going through the press. This monograph on the park will be published in two parts. Part II, which is mainly descriptive in its treatment of the subject, is about ready for the press. The collaborators on this work include Prof. J. P. Iddings, W. H. Weed, Charles D. Walcott, T. W. Stanton, G. H. Girty, and F. H. Knowlton. The latter furnishes a chapter on the fossil flora of the park, describing in detail the collections made from time to time in this region. The illustrations are in an advanced state of preparation.

Mr. Bailey Willis has been engaged in reconnoissance work in northwestern Washington. He examined recently the glaciers on the northern and western slopes of Mount Rainier, and found that the Puyallup glacier had retreated at least 600 and possibly 1,000 feet from the position it occupied when he examined it in 1883. His examination of the region about Mount Rainier has intensified his former impression that it is unique in character and should be set aside as a national park.

The investigations of the Irrigation Survey (a Division of the U. S. Geological Survey) consist of three distinct classes of work. The first comprises the measurement of streams and determination of the surface supplies in lakes and rivers. The second, the examination of underground currents and artesian wells. It is mainly geologic in character, as distinguished from engineering surveys. The third class of work consists in the preparation of short popular reports giving the results of the measurements of streams, and describing the methods of utilizing the water resources, particularly for irrigation. The work of this Division has been continued through eight years. Men have been trained in its operations and instruments have been devised and tested. Mr. F. H. Newell is the chief officer in charge.

A number of papers upon water supply and irrigation, especially those of a popular nature, are being prepared for publication. The scope of these papers is broad, embracing subjects from the technical description of river measurements and results, intended mainly for engineers, to the general descriptions and directions for constructing irrigating plants, designed for the farmer. Arrangements have been made for papers upon the following subjects: River measurements in the East; River measurements in the Missouri drainage; River measurements west of the Rocky Mountains; The water power of a portion of New England; The water power of the Southeastern Appalachian slope; The water supply of Indiana; Recent development of Artesian wells and irrigation in the Dakotas; The underground waters of eastern Nebraska; Water supplies of southeastern Kansas; Methods of irrigation on the Great Plains; Methods of applying water in Arizona and in California; Seepage waters from irrigation; Water storage in Big Horn Mountains; Efficiency of windmills in irrigation; Sewage irrigation; Artesian conditions of eastern Washington and western Idaho; Water supply in the vicinity of Devil's Lake. The first paper of the series, that by Mr. H. M. Wilson upon pumping water for irrigation, is in press.

The results of the work of the Geological Survey in this connection are best shown by the publications (27 in number) relating to water resources, most of them having been prepared in the Division of Hydrography.

HYDROGRAPHIC OFFICE.—The United States Hydrographic Office is engaged in collecting information of a commercial and non-military character relative to the regulations, facilities, etc., of the various ports of the world.

The set of general ocean charts issued by this office has been completed. The set of general coast charts of the Western Hemisphere is practically complete. A very large proportion of the special coast charts of the Western Hemisphere is available for issue, and work has been extended into the Eastern Hemisphere.

The Pilot Chart of the North Pacific Ocean is now permanently established, and issued regularly on the 23d of each month for the succeeding month, in order to allow for transmission to the Pacific Coast by mail. Daily observations received are not yet numerous enough to permit the plotting of the storm tracks of the North Pacific on the chart.

ALASKA.—The prospects are good for immediate negotiations for the precise demarcation of the coastwise Alaskan boundary.

Proposals have been accepted for the immediate location of the line along the 141st meridian by setting international monuments at or between convenient points already determined by independent American and Canadian surveys.

The Government has recently established a post-office at Circle City, 900 miles inland on the upper Yukon River. This mail service through the heart of Alaska is somewhat unique. A vast part of the territory is wild and uninhabited, but about the recently discovered gold fields there has sprung up a rude sort of civilization. Miners and others compelled to trust to chance in sending out their mail sometimes pay a dollar a letter for the privilege of sending by persons leaving camp for civilization. The mail is now carried by river, Indian portage and dog trains. The first trip was made June 11, when 1,474 letters were started from Juneau and carried into the Circle City post-office on the 14th of the following month. The return trip was made *via* St. Michaels and Bering Sea. Circle City is a place of 1,800 people. The only Government official is the Postmaster, who says town lots are selling for $2,000 each.

The editor of the *Mining Record* has compiled data showing the gold output of the Territory for the current year to be $4,670,000. The output for 1895 was $3,000,000. That estimated for 1897 is $6,000,000.

COMMANDER ISLANDS AND BERING SEA.—Leonhard Stejneger, who was associated with David Jordan and others as a Government Commission to make an investigation of the seal islands of Bering Sea, gives a large amount of new information* concerning the geography and history of the Commander Islands, and of the hydrography of the west portion of Bering Sea.

The treatise referred to is based upon observations gathered during two different visits, the first in 1882–83, the latter in 1895. Mr. Stejneger claims that he is in possession of a great amount of interesting information about these islands never published, or else very inaccessible. He presents a chart of the western portion of Bering Sea prepared by himself, on which the deep-sea soundings of the *Albatross* (1892–95) are here first shown, as well as curves connecting them with the *Tuscarora* soundings (1874), and asserts as the results of recent investigations that the following points may now be regarded as fairly well established: (1) The Commander Islands are situated on the extreme eastern point of a plateau-like ridge, having a probable average depth of about 500 fathoms, and extending eastward from the coast of Kamchatka. (2) This plateau rises very abruptly from an ocean floor of a little more than 2,000 fathoms, so that the islands on their northern and eastern sides rise nearly perpendicular out of this depth. (3) Between the Commander Islands and Attu — the nearest of the Aleutian Islands, there is a gap certainly more than 1,900 fathoms deep. (4) The bottom of Bering Sea to the east of Commander Islands forms a nearly level floor of an almost uniform depth of 2,100 fathoms, sending off an arm or bay of equal depth to the north of the islands towards the neck of the Kamchatkan peninsula.

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* See his *Russian Fur-Seal Islands*, Washington, 1896.

Detailed descriptions of the fauna, flora, meteorology and population of each of the islands of the Commander group, and of other Russian islands in Bering Sea, based on personal observations, make us better acquainted with these little-known regions.

Census Methods.—The International Statistical Institute at its session in Bern in 1895 appointed a committee to consider the propriety of urging all the leading governments that are in the habit of taking decennial censuses to fix practically a uniform date, like the year 1900, and also to arrange for some uniformity in the inquiries, for the purpose of general and international comparison. Hon. Carroll D. Wright, American member of the Institute, was made a member of the Committee. Congress practically indorsed the proposition on behalf of the United States by a joint resolution, approved March 19, 1896, directing the Superintendent of the Census to confer with the census officers of other governments for the purpose of securing uniformity in the inquiries relating to the people to be used in the census of 1900 and future censuses. The Superintendent says the work of the Bern Committee is going on satisfactorily. This is probably the most important movement of the century in the direction of statistical inquiry.

The Superintendent of the Census has formulated a plan for a permanent census service, so that there shall be a more scientifically arranged system under which the Federal censuses of the future may be taken, and to bring out results with greater promptness. Practically the Government has already a continuous census service, either under a superintendent, or a chief of a division, or a census clerk attached to the Interior Department. Col. Wright proposes the establishment of a census bureau separate and unattached from any other department of the Government, but under the control of a director, aided by an assistant, a chief clerk, a disbursing clerk, five chief statisticians, and necessary clerks and employés. The plan provides for a general census to be taken April 15, 1900, and every ten years thereafter, which will include a wide field of inquiry and investigation, and an enumeration of the people every five years.

All the volumes pertaining to the Eleventh Census (1890) are now either published or in the hands of the printer. There are 25 volumes of final reports and 24 miscellaneous volumes and monographs. The following is a complete list:

FINAL REPORTS.

Agriculture, including Agriculture by Irrigation and Statistics of Fisheries.
Alaska, Population and Resources.
Churches.
Crime, Pauperism, and Benevolence, Parts I and II.
Farms and Homes: Proprietorship and Indebtedness.
Indians, Taxed and not Taxed, in the United States (except Alaska).
Insane, Feeble-minded, Deaf and Dumb, and Blind.
Insurance, Part I (fire).
Insurance, Part II (life).
Manufacturing Industries, Part I (totals for States and Territories and industries).
Manufacturing Industries, Part II (totals for cities).
Manufacturing Industries, Part III (selected industries).
Mineral Industries.
Population, Parts I and II.
Real Estate Mortgages.
Transportation, Part I (by land, embracing reports on steam railroads, street railways, including horse railways, cable railways, electric railways, and steam railways engaged exclusively in city passenger traffic).
Transportation, Part II (by water, embracing reports on the Atlantic Coast and Gulf of Mexico, Pacific Coast (exclusive of Alaska), Great Lakes, Lake Champlain, rivers of the Mississippi Valley, canals and canalized rivers, and express companies).
Vital and Social Statistics, Parts I, II, III and IV.
Wealth, Debt, and Taxation, Part I (public debt).
Wealth, Debt, and Taxation, Part II (valuation and taxation).

MISCELLANEOUS VOLUMES.

Compendium of the Eleventh Census, Parts I, II and III.
Abstract of the Eleventh Census, first and second editions.
Special report relating to occupations.
Statistical Atlas.

Monographs.

Vital Statistics of the District of Columbia and Baltimore.
Vital Statistics of New York and Brooklyn.

Vital Statistics of Boston and Philadelphia.
Social Statistics of Cities.
Marble Quarrying.
Moqui Pueblo Indians.
Cherokee Indians.
"Six Nations" Indians.
"Five Civilized Tribes" Indians.
Electrical Industries in the State of New York.
Education.
Street Railways.
Transportation on the Pacific Coast.
Transportation on the Rivers of the Mississippi Valley.
Transportation on the Great Lakes.
Textiles.
Irrigation.
Glue.

In addition to the above, 380 Bulletins and 99 Extra Bulletins (quarto pamphlets) have been issued since 1890, announcing results as the work progressed.

TERRITORIES.—The development of Oklahoma during 1896 has been greater probably than any other portion of the United States. The Territory is gaining considerable notoriety as a health resort, on account of the dry, delightful climate of the spring, fall, and winter months. The population, now numbering 275,000, is largely American by birth. Perhaps few States are more distinctly so. The adventurers and speculators, who at the opening of the reservation took possession of the homesteads, are steadily relinquishing their holdings to a more substantial class. The assessed valuation of the Territory is $24,815,711. The deep-water harbor at Galveston will place Oklahoma 1,000 miles nearer an export point, and therefore her people are very much interested in that undertaking. The consequent reduction of freight rates will prove a great factor in the material development of the country. The railroad lines are doing a profitable business.

The proposition is made that preparatory to the admission into the Union, Arizona and New Mexico should be reunited, that Oklahoma be joined with them, and the three made into one State. This would close the State-making era for many years to come, as the only Territories remaining would be the District of Columbia, the Indian Territory, and Alaska, neither of which make serious pretensions to statehood.

New Mexico and Arizona were originally one territory, and included portions of Colorado and Nevada. The proposed consolidated territory contains about 275,000 square miles,—an area more than twice as large as Great Britain and Ireland,—and a population five times greater than the State of Wyoming and six times greater than Nevada.

Notes.—Commissioners have been appointed to confer with a similar commission on behalf of Great Britain and the Dominion of Canada to inquire into the feasibility of constructing a deep waterway for seagoing ships between the Great Lakes and the Atlantic Ocean.

The assent of the chief maritime nations having been given to the lately perfected International Rules for the prevention of collisions at sea, and to the proposal of the United States that those rules shall be put in operation July 1, 1897, the negotiations—long protracted—have reached a satisfactory result.

Commander Z. L. Tanner's account of operations of the *Albatross* in Bering Sea during 1893–94 has recently been published, accompanied by a chart compiled from all available sources.

Intercontinental Railway.—The Intercontinental Railway Commission is still at work on the final report. The surveys that have been made by several corps of engineers extend from Mexico to Bolivia. The report will comprise about eight quarto volumes of text and plates, and will surpass in interest anything in this line since the publication of the surveys for the great railroad routes to the Pacific Ocean in 1856.

The Committee, it will be remembered, was an outgrowth of the conference between the Republics of North and South America, held in Washington in 1890. The railroad project contemplates a trunk line through a part of Mexico, Guatemala, Salvador, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Ecuador, Peru and Bolivia, with branch lines extending into Venezuela, Chile, Argentina, Paraguay and Uruguay.

The confederation of the Republics of Nicaragua, Honduras, and Salvador under the name of the "Greater Republic of Central America" seems to be in effect an alliance for mutual protection against outside pressure. Señor Rodriguez, the accredited representative, is in Washington awaiting official recognition. The three republics have a population of about 1,500,000, and foreign trade valued at $20,000,000 annually. It is stated that so far the Department of State has not been assured as to the exact nature of the combination.

H.

MAP NOTICES.

Since our last notice the United States Geological Survey has issued 39 sheets of the general atlas of the United States, besides two special maps of mining districts. These sheets are scattered widely over the country. Two are in western Maine and bear the names Sebago Lake and Bridgton. These sheets, upon the scale of 1:62,500, in 20-foot contours, represent a portion of the glaciated region of that State, covered with high, rounded hills, and dotted with glacial lakes.

Two sheets are presented us from Vermont, known as Manchester and Pawlet, comprising parts of the Green Mountains, and including several summits exceeding 3,000 feet in altitude.

In New York there is but one sheet, Fonda, comprising a part of the lower valley of Mohawk River.

In Minnesota are two sheets, representing the "twin cities," Minneapolis and St. Paul, and the adjacent country, upon a scale of 1:62,500, and with a contour interval of 20 feet. They are covered with the irregular, infinite detail of glacial deposits, with innumerable little ponds, which are of so recent formation that many of them have not yet established outlets. The great trough of the Minnesota River, indicating the former existence of a much larger stream, is well shown.

From North Dakota are three sheets, one of them, Fargo, being comprised partly in Minnesota. This includes a portion of Red River valley, the former bed of Lake Agassiz, which has been drained so recently that the river system is in an extremely infantile condition. Streams are few in number and have as yet excavated merely ditches of trifling depth. The country here represented is probably as level as any part of the earth. The other two sheets in North Dakota, known by the names of Tower and Eckelson, lie west of the Fargo sheet, extending over to James River, and include a portion of the valleys of that stream and the Sheyenne, and a part of the eastern slope and summit of the Coteau des Prairies. This country is covered with small glacial deposits, interspersed with glacial lakes, and its drainage system has not made great progress in development since the retreat of the glacier.

In South Dakota are two sheets, known as Harney Peak and Oelrichs, both in the Black Hills, the former being in the central part of this mountain mass, while the latter is upon its southeastern border, and represents a portion of the hogback structure which the stratified beds surrounding the mountain mass have assumed. All the above sheets in the Dakotas are upon the scale of 1 : 125,000.

In Nebraska are eight sheets, all upon the scale of 1 : 125,000. These bear the names, Kearney, Lexington, Stromsburg, Arapahoe, Holdrege, Wood River, Red Cloud and Fremont. Most of them include portions of the valley of the Platte, representing it as a broad valley, ten to twelve miles in width, nearly level, and bordered upon either side by bluffs from 100 feet to 300 feet in height. Upon the south these bluffs are partly buried in sand hills, the sand having probably drifted there from the valley and bed of the river. This broad valley of the Platte extends from the forks of the river eastward nearly to Omaha. Upon the Fremont sheet, only a few miles west of Omaha, the broad valley ceases and the river turns into a narrow valley between bordering bluffs, in which it flows to its mouth. This broad valley of the Platte is a valley of deposition and the river is found flowing upon the higher part of the valley rather than along its lowest line. This is shown not only by the contour lines, but by the fact that its tributaries enter the valley and flow in it for many miles before being able to join the main river. This is notably the case with Elkhorn, Loup and Wood rivers, which flow for scores of miles along the northern edge of the valley before they find an opportunity to pour their waters into the river. Three of these Nebraska sheets represent country lying south of the Platte, mainly upon the drainage of the Republican Fork of Kansas River.

In Kansas there are five sheets, all upon the scale of 1 :125,000, and bearing the names, Ashland, Russell, Osborne, Plainville and Hays. They are mainly in the central part of the State and represent the region of the plains.

In Texas are three sheets. Brackett, which is southeast of the Llano Estacado, represents a region containing but little flowing water, and without much relief, with the exception of the Anacacho Mountains, a group of hills rising in the highest summit to an altitude of 1,500 feet. The other two sheets in Texas, which bear the names Rio Grande and Polvo, represent portions of the Rio Grande and the country on the United States side immediately adjacent.

In Colorado there is only one sheet, Pueblo, upon the scale of 1 :125,000, and a detailed map of the Ten Mile Mining District, near Leadville.

From Montana is a special map of the mining region about Butte, upon the scale of 1 :15,000, showing with infinite detail the natural and cultural features of this, the greatest copper mining camp in the world. Not only is every house represented, but all mine openings, smelters, mining dumps, etc.

From California are ten sheets, all upon the scale of 1:62,500, and all grouped in the region known as Southern California, *i. e.*, south of the crest of the San Bernardino Mountains. They bear names as follows: Santa Monica, Pasadena, Pomona, San Bernardino, Anaheim, Downey, Redondo, Las Bolsas, San Pedro and Santa Ana. These sheets represent a region of great interest to the geologist, the health-seeker and the agriculturist, and warrant a somewhat detailed description.

Across the State stretches, from Colorado River to the Pacific coast, a range of mountains. Its different portions bear different names, the eastern, highest portion, being known as San Bernardino; north of Los Angeles it is called Sierra Madre, while the western part is known as San Buenaventura. Its highest peak, Baldy, has an altitude of more than 12,000 feet. From this peak, near the middle of the range, the mountains diminish in height east and west, reaching the west coast with an altitude not greater than 3,000 or 4,000 feet. The Sierra Nevada and Coast ranges unite with these mountains at their southern extremities.

North of this range, near the coast, stretch the Coast ranges and the fertile valleys between them. Farther east is the San Joaquin Valley, limited on the west by the Sierra Nevada. Still farther east, and forming the north base of the San Bernardino Range, is the Mojave desert, stretching between the Sierra and the Colorado River. This approaches, perhaps, as nearly to an absolute desert as any area on the continent. It has an almost level surface, broken only by volcanic buttes and short, narrow ranges, and a soil ranging from hard, alkaline clay to a loose, powdery consistency, and from coarse gravel to drifting sand. Its vegetation is strange, consisting of scattered bushes of various thorny species, cacti in great variety, and yucca. Among these the tree yucca is the most prominent, standing 20 to 30 feet in height, with straight stem and few branches, each tipped with its sheaf of bayonets.

This range is of granite, with no outlying foothills of stratified beds. On either side granite slopes rise abruptly from the valley. With the exception of a little timber near the summits of a few of the highest peaks, it is entirely devoid of forests. It is covered, however, with dense chaparral 6 to 8 feet in height, composed in large part of thorny bushes, forming an almost impenetrable abattis.

The range has been greatly eroded by streams, so that it presents an infinite detail of cañons, gulches and spurs. Indeed, the broader features of the range are almost concealed in the infinite variety of detail. This great multiplication of details seems to be a result of the want of forest cover to the range. Timbered mountains are commonly eroded into large, broad features, while bare mountains are eroded, as are these, into fine details.

The stream cañons and gulches are short, with steep slopes to the edge of the valley. Few of them carry water except in the winter, the rainy season, and then, for a time, they carry large volumes.

South of this range lies a valley sloping gently southward. Its western part is limited on the south by the Pacific Ocean, its eastern part by the San Jacinto Mountains. This valley is the garden of southern California. Near its western end is Los Angeles, near its eastern end San Bernardino, while between the two cities are numerous beautiful little towns, strung along the Southern Pacific and the Atchison, Topeka and Santa Fé Railroads. For fifty miles it is almost a continuous city, the towns being connected by orange orchards, vineyards and truck farms.

The climate of this valley is arid. Little rain falls upon it, and that little in the winter. The soil, however, is extremely fertile, and when irrigated becomes a veritable garden, while without irrigation it is a desert. Thus, one sees in close juxtaposition the widest contrasts, on one side of the road an almost tropical luxuriance of vegetation, on the other cacti and sterility.

This valley commences on the north with a somewhat steep southward slope, which gradually becomes more gentle, and finally rises a little as the base of the San Jacinto Mountains is neared. Its northern slopes present very interesting and significant details. An examination of it on the ground, or on a good map, shows that at the mouth of every cañon issuing from the mountains the land is higher than it is elsewhere, the form of the elevation being that of a part of a cone, with the apex at the cañon's mouth, and spreading southward. Upon this cone is commonly found the stream-bed, most of the year a dry bed of sand. It may be found upon the highest line of the cone or upon the side. It may be a single stream-bed, but more commonly it is divided downward, as is the case with the lower Mississippi, and these bifurcations may unite, forming in some cases an intricate network of stream-beds upon the cone. In some cases the stream-bed is found on one side of the cone, as though it had slid off from its position of unstable equilibrium.

This succession of "alluvial cones," as they are called, is the most interesting topographic feature of the valley. These cones are being formed by deposition of detritus—sand, gravel and soil brought down from the mountains by the streams when in flood. These streams, as was above stated, have steep courses in the mountains, and consequently flow with great velocity. On reaching the margin of the valley this velocity is suddenly checked, and consequently a large part of the detritus is dropped in the stream-bed and on the banks. Having thus built up its bed above the neighboring country, the stream, having an unstable course, leaves it, to take up a neighboring position. This bed in turn is built up and the stream abandons it for a new one.

In this way the stream builds up its alluvial cone, raising it when it flows upon its surface, widening it when flowing along its margin. The coarser detritus is, of course, dropped first, and is found at or near the mouth of the cañon, while the fine material is carried far down into the valley. At the mouth of the cañon are found great boulders weighing hundreds of pounds, which attest the enormous power of these streams when in flood.

Near the mountains these deposits of sand and gravel are of enormous thickness, and they form a great storehouse of water. In the wet season they are saturated from the streams, and they give up the water to the hundreds of artesian wells which have been bored in this valley. Indeed, the water supply for a large part of the irrigation of this valley is derived from these wells.

The State Forestry Commission of New Hampshire has published from the copper-plates of the U. S. Geological Survey a map comprising about 900 square miles, in the central and highest portion of the White Mountains. Besides the representation of topography this map shows, by a green tint, the distribution of woodland over the area, its outlines having been located accurately by surveyor. Of the entire area of 900 square miles represented on the sheet, it is probable that less than 50 square miles have been cleared, the rest being covered with forest.

Relief Map of New Jersey, 1896. John C. Smock, State Geologist, C. C. Vermeule, Topographer. Scale: Four miles to one inch. Julius Bien & Co., New York.

This map is another of the interesting series of by-products of the survey of New Jersey. The map of the State was originally published on the scale of one mile to an inch. From this map a model was prepared, which was exhibited at the World's Fair in

Chicago, and this relief map has been prepared from photographs of this model. The northern third of New Jersey is a hilly country, being intersected by numerous ridges of the Appalachian system. The southern two-thirds is almost a plain. Owing to the exaggeration of the vertical element in the model, this map gives a very false impression of the topography of the State. The relief of the hilly country is greatly exaggerated, while the lower part of the State is represented, not as a plain, but as a country of irregular hills. The principal purpose of such a map as this is educational, and as an educational factor it will be highly misleading. It is greatly to be regretted that the mistake of exaggerating the relief and thus falsifying the representation of topography, has been committed.

The execution of the work by the well-known firm of Bien & Co., is most admirable, leaving nothing to be desired in this respect, indeed, it is one of the finest examples of lithographic work which this country has yet produced.

A preliminary agricultural map of Tennessee, based on the distribution of geological formations, compiled from the most recent data, under the auspices of the Tennessee Agricultural Experiment Station. Chas. W. Dabney, Jr., President. Photolith. by Hoen & Co , Baltimore, Md.

The soils of the United States may be broadly classified as: (A.) Those transported from a distance by glaciers, winds, rivers, etc. The soils of the northern United States were mainly derived from the rocks underlying more northern regions, whence they have been transported by the Great Northern Glacier. Those of the alluvial region of the Mississippi have largely been brought from the Great Plains. (B.) Indigenous soils which are formed by the disintegration of the underlying rocks, and are transported little if at all. Of the latter class are nearly all the soils of Tennessee, and therefore a geological, or more strictly, a lithological map of this State is a soil map.

This map is an adaptation of a geological map to the distribution of soils. This adaptation is effected by the subdivision of certain of the geological ages, separating limestones from sandstones, shales, etc. The legend, which is very voluminous, explains not only the several geological ages, and the character of their rocks, but the characteristics of the soils produced by their disintegration. The map is a clear presentation of the distribution of soils throughout the State.

Mapa de la Isla de Cuba. Published by J. L. Smith, Philadelphia, 1897. Scale: 25 miles to an inch.

This map was evidently published as an aid in the interpretation of war news from the island, and in that capacity it will be found convenient; although its usefulness might have been increased by the addition of more place locations and names. The relief of the island which plays so important a part in the war is inadequately expressed. One distinct advance made by this map consists in the use of Spanish place names, instead of the English equivalents.

Besides the general map of the island, the sheet contains enlarged maps of Habana province and city.

Petermanns Mitteilungen for September, 1896, contains a botanical map of Northern Venezuela (Scale 1:3,000,000), accompanying a descriptive article by Prof. Dr. W. Sievers. It represents by tints the characteristic vegetation of different parts of the country, such as mangrove regions, coast vegetation, savannas, sand washes of the Llanos, etc. To this classification of the regions of indigenous vegetation are added cultural facts, such as the regions in which are cultivated coffee, cocoa, fruits, etc.

The *Mitteilungen* for October, 1896, contains "Original Karte von Ukambani und dem Kenia-Gebiet," von Joh. George Kolb, scale 1:1,000,000, illustrating Prof. Kolb's narrative of his two expeditions, 1894–1896. This portion of eastern Africa has, by virtue of the numerous expeditions which have traversed it, become thoroughly well known.

Petermanns Mitteilungen, Ergänzungsheft 117, contains "Der Nordfuss des Dagestan und das vorlagernde Tiefland bis zur Kuma," von Dr. G. Radde und E. Koenig. It is accompanied by a map of the Northwestern Caucasus, scale 1:1,500,000 (about 25 miles to an inch). Relief is expressed by crayon shading.

Petermanns Mitteilungen, Ergänzungsheft 118, contains "Reisen in Nord und Zentral Persien," von A. F. Stahl. It is accompanied by a map in 3 sheets, illustrating Gen. Stahl's journeys, on a scale of 1:825,000, or about 13 miles to an inch. Relief is expressed by crayon shading. The map shows in some detail the country south of the Caspian Sea (latitude 37°) to latitude 30°, and from long. 49° to 55°.

Carte Hypsométrique de la Partie Occidentale de la Russie d'Europe, et des Regions Limitrophes de l'Allemagne, de l'Autriche-Hongrie, et de la Roumanie, par le Lieutenant-Général Alexis de Tillo. Échelle 1:1,680,000.

This map is contained in the *Annales de Géographie* of April 15, 1896. It represents the relief of the region described in the title, by means of contours and tints of color, ranging from deep green through browns and oranges to white. The contour interval is about 40 metres, each contour interval receiving a distinct shade of color, and thus making a wonderfully effective relief map.

The map includes the Karpathians and the Transylvanian Alps, rising from sea level to heights exceeding 2,500 metres.

Carte des formes de la Vie Végétale et Animale dans le Haut Nil: Carte des formes de la Vie Des Sociétés Humaines dans le Haut Nil. Dressée par E. de Martonne. Échelle 1:6,000,000.

These maps are from *Annales de Géographie* of October 15, 1896. The first, colored to show forested, savanna, and desert areas, represents also the distribution of certain typical plants and animals. It is accompanied by a small map, showing rainfall and altitude.

The second represents the distribution of the natives by occupation, and is accompanied by a small map showing the density of population.

The *Annales de Géographie* of July 15, 1896, contains a small map of the Pamir, showing the progress made in dividing it up among civilized powers in the past 14 years. The feature of the map is the rapid progress made by Great Britain in acquiring territory in this far-away region. Either directly or by the aid of tributary tribes, this country has established claim to most of the Pamir, the summit of the world.

Service Géographique des Colonies. Mission Marchand: le Transnigérien le Bandama et le Bagoe, Carte Levée et Dressée de 1892 à 1895, par Le Capitaine Marchand. Scale 1:500,000.

This map is an extensive contribution to our knowledge of the countries bordering on the Gulf of Guinea, lying mainly between the two forks of the river Bandama. The streams are printed in blue, routes of travel in red, and relief is expressed by brown hill shading. The forested regions are indicated by a green tint.

Ministère des Colonies. Côte d'Ivoire: Carte de la Région Cotière de Fresco au Cavally Levée et Dressée par H. Pobeguin, Administrateur Colonial par Ordre de M. le Gouverneur Binger, 1895–1896.

This map is comprised in eight sheets, together with a *tableau d'assemblage.* The scale of the sheets is 1:150,000. Besides the general map upon this scale there are detailed maps of towns and trading posts upon much larger scales.

The main map, which is printed entirely in black, represents the streams and principal routes of travel, settlements, native and European, and the relief, although the latter is but faintly expressed. Upon the maps of the towns and trading posts relief is expressed by contour lines.

BOOK NOTICES.

The Jesuit Relations and Allied Documents. Travels and Explorations of the Jesuit Missionaries in New France, 1610–1791. The original French, Latin and Italian Texts, with English Translations and Notes; Illustrated by Portraits, Maps and Fac-similes. Edited by Reuben Gold Thwaites, Secretary of the State Historical Society of Wisconsin. Vol. 1, Acadia: 1610–1613. Cleveland: The Burrows Brothers Company, Publishers, MDCCCXCVI.

The Editor says, in the General Preface:

> We shall . . . reissue all of the documents usually designated as *Relations* —the Cramoisys, the Quebec reissue, the Shea and O'Callaghan reprints; and to these will be added a very considerable collection of miscellaneous papers of importance, from printed sources and from manuscripts, in order to fill the chronological gaps and round out and complete the story. It is the purpose of the Editor to present this mass of selected material in chronological order, so far as proves practicable, and to furnish such scholarly helps as will tend to render it more available than hitherto for daily use by students of American history. To this end will be given an English translation, side by side with the original text . . . . the first attempt to translate the entire body of the *Relations.*

There cannot be two opinions as to the usefulness of an enterprise conceived in such a large spirit, but it must be said that the execution leaves something to be desired. The proof-reading is for the most part good, even in the difficult original French and Latin texts, and some of the few slips noted may belong to the early printer. On page 56, for instance, the King is made to write bad French:

> Pendant lequel temps defences sont faictes a tous Imprimeurs, Libraires, & autres de quelque estat, qualité, ou condition qu'ils soient, de non imprimer, etc.

The effect of the *non* is to nullify the prohibition, and the translator has passed it. If it exists in the original, it should have been so marked in the reprint.

On page 72 *and* has taken the place of *et* between the words *beauté* and *bōté*, and a few other trivial mistakes will be found, such as *sainct* for *saincte* (p. 62), *parternelle* (p. 160) for *paternelle*, and *patienta* (p. 196) for *patientia.* Few as they are, these are so many blemishes.

The translation is the least satisfactory part of the work. While it is faithful in a way to the general sense of the original, it is unequal in style, too diffuse in some passages and in others too much condensed, and the extremely modern spelling of such words as *luster*, *christianity*, *lent*, *sepulcher*, *satan*, *moldy*, is offensive in a serious book. A few quotations will suffice to show the translator at work:

> Nous sommes touchés d'vne ie ne sçay quelle lethargie en ce qui est du zele religieux qui bruloit noz peres anciennement (pp. 86, 88).
>
> We are touched by an inexplicable apathy in religious matters, which is quite different from the fervid zeal which of old burned in the bosoms of our fathers (p. 89).
>
> Une belle nuict ainsy qu'estant au lict nous pensions prendre quelque repos, voicy qu'un gentil et hardy coup de mer qui faussa les fermetures de la fenestre, la rompt et nous vient couvrir bien hautement (p. 148);
>
> One fine night, as we were lying in bed, trying to get a little rest, a neat and impudent wave bent our window fastenings, broke the window and covered us over completely (p. 149);
>
> Gulæ irritamenta, & inimicas bonæ ac sanæ menti potiones, ab Europæis mercatoribus acceperunt, quibus lucri bonus est odor, etiam ex flagitio, & scelerata nundinatione (p. 284).
>
> They have received stimulants of the appetite, and drinks hostile to a good and sound mind, from European traders, who think much of profit, even when tainted with the disgrace of a wicked traffic (p. 285).

There are too many words in the first translation. In the second a simple and natural French expression masquerades in English as *a neat and impudent wave*, and in the Latin passage the words, *quibus lucri bonus est odor* (to whom the smell of gain is good), with their reminiscence of Vespasian, lose their vigour in the rendering: *who think much of profit.*

If these are not really bad translations, they may be described as honest but poor, without life and without colour.

On p. 148 is the following passage:

> Nous estions environ ces Açores le mardy de Pasques, quand nous voici en prouë notre ennemy conjuré, l'Ouest. . . . .
>
> We were near these Azores on Tuesday of Easter week, when suddenly we became a prey to our sworn foe, the West wind. . . . . (p. 149).

Here is a confusion of *prouë* (prow) with *proie* (prey), and the construction has been forced to suit the latter word. The west wind blew dead ahead (*en prouë*).

A more remarkable misapprehension occurs on p. 197, in the Eulogy and Life of Father Peter Biard:

> Novissime regionis præfectus Marchio Ragnius, jussus a rege copias in Campaniam ducere contra Ernestum Mansfeldium Galliæ finibus imminentem, Biardum sibi adsciverat comitem expeditionis & sacrorum ministrum (p. 196).
>
> Finally, the prefect of the district, Marchio Ragne, upon being ordered by the King to lead troops into Campania against Ernest von Mansfeld, who was threatening the frontiers of France, had selected Biard as his companion during the expedition, and as a minister of sacred rites (p. 197).

It is not essential, but it would be pleasant to know who Marchio Ragne was. His name is a puzzle, all the more difficult that *Marchio* is the Latin for *marquis*, with which *Ragne* refuses to agree. Even stranger than his name is the task imposed upon him of leading troops into Campania against Ernest von Mansfeld. There is but one Campania known to English readers and that is the region of Naples and Pompeii, Sorrento and Amalfi, and other famous places in southwestern Italy.

Why should Louis XIII. send troops into Italy to operate against Mansfeld, who was threatening the frontiers of France? The answer is that he did not send soldiers into Campania. He sent them into Champagne, a province then under the government of the Duc de Nevers, who succeeded in frustrating the designs of Mansfeld.

The translator of the *Relations* ought surely to have recognized the Latin name of Champagne, when he met with it in a passage recalling the attempted invasion of France by a renowned leader.

Two other examples of careless reading may be quoted.

On p. 205 the following occurs:

> Mexico, a part of Florida and of California, belongs to the Spanish dominions.

The Latin original on p. 204, instead of identifying Mexico with Florida and California, says distinctly that Mexico, a part of Florida, and the Californias are under the Spanish dominion:

> Mexicum, Floridæ pars et Californiæ, sunt Hispanæ ditionis.

On p. 288 is the following passage:

> Quippe in homine carnali, ut ait è SS. PP. nonnemo, tota ratio intelligendi est consuetudo cernendi.

The translation on the opposite page reads:

> For, plainly, in the physical man, as some one from Sts. Peter and Paul says, the entire system of knowledge is based on vision.

If the translator had taken the lesson of the text to heart, he would have hesitated before laying irreverent hands upon St. Peter and St. Paul. The abbreviation SS. PP. stands for *Sanctis Patribus*, and the clause should read: *as some one of the Holy Fathers says.* The writer of the *Relation* was quoting the words of a Father of the Church, whose name he did not remember.

The value of the tense is not always regarded, and the renderings are either capricious or un-English. On p. 58, *ils peuvent avoir retenu cette obscure doctrine* becomes in the English version (p. 59), *they might have handed this obscure doctrine down.* On p. 131, *as much as they liked* is printed as the equivalent of the French *tout à leur* *aise.* On p. 105 we read: *Thereupon the eyes of the offended were full of ire* . . . ; but the text on the opposite page has: *La-dessus, la colere monte au front des offensés* . . . On p. 247, the words *nivium quibus terra* . . . . *continenter inhorrescit* are rendered: *of snow* . . . . *with which the land* . . . . *is continually desolated.* On p. 254 is the description of a bird:

> . . . gallinæ similis, si molem spectes ; pennis in tergo nigricantibus, sub alvo candidis.
>
> (. . . like a hen, if you look at its size ; with feathers blackish on the back and white under the belly.)

The translator's English on p. 255 is curiously unlike the Latin: it tells of a bird

> . . . which is about the size of a cock ; its wings are black on the outside and white beneath.

It is not too much to ask for better work in the future volumes of the *Relations.* The reprint of the original texts should be without reproach; equal, at least, in accuracy to a school edition of Horace or Virgil. There is little doubt that the translators are capable of doing their part fairly well, if kept under strict supervision, and no doubt whatever that, if they go on as they have begun, the English translation will be of very little service.

As a specimen of the book-making art the volume deserves high praise. It is well printed on excellent paper and well bound, and it is illustrated with two facsimile reproductions of title-pages, two maps reduced from those in Lescarbot's *Histoire de la Nouvelle France* (1612), and a folding Historical Map of New France, showing missions, forts, postage-routes, tribes, etc.

The Earth and its Story : a First Book in Geology, by Angelo Heilprin. Pp. 267. Silver Burdett & Company, Boston, 1896.

The popular introduction to geology just issued from the pen of Professor Heilprin is worth more than its cost for the extremely clear and well-chosen pictures that illustrate it. In this way it meets the need of the elementary reader better than any other book on the same subject that we know. The book is written in a popular vein and is in most cases extremely readable. The similes are simple and familiar, and many suggestions of the larger relations of geology and of the earth features are made prominent. As a popular reader for collateral use with some other introductory book in geology, it is to be highly commended. As a text-book to be used alone, it cannot be so commended.

The statements lack definiteness and completeness in many cases. Facts are not always related in a good classification, and the reader would readily gain the impression that all was simple and easy in geology. The pupil would gain but a "general notion" of certain subjects from this volume, and herein lies the weakness of the book. It would never lead the pupil to become an inquisitive and accurate scientist and investigator, and would fail in many cases to give him the necessary fundamental ideas needed for further work.

Among the subjects that might be amplified and made more intelligible are the difficult conceptions of strike and dip, which are always stumbling blocks to the beginner. River terraces and water gaps are not explained even so well as our present knowledge would allow, and the generalizations about the origin of the latter features lack clearness to one not wholly familiar with peneplains and superimposed rivers. Drumlins, eskers and kames are grouped together as "pyramidal or lenticular mound-like hills of sands and cobbles." No attempt is made to make intelligible the fundamental classification of drift into water and ice deposits.

An excellent example of the lack of fidelity to truth is seen in this sentence on p. 96, "When in our rambles across the country we come upon giant rock masses that protrude their heads through a crumbling soil or the smiling carpet of grass and flowers, we know that in these rocks we have evidences of former possession by the sea." The erroneous conception thus given is not explained away in the paragraphs on the permanency of continents that follow.

Professor Heilprin has followed in part the classification of land forms given us by modern physiography, and it is to be regretted that he has not followed this classification uniformly. For instance, he departs from the principle when he fails to call a volcanic neck an "old" volcano, and when he appears to make a distinction between lands that have been drowned and those that have been submerged, as he does in speaking of fjords. This lack of uniformity in treatment causes many impressions to be somewhat confused in the minds of those not well versed in the subject-matter. The author appears to hold a little more strongly to the English idea of plains of submarine denudation than do most of the modern geologists, and gives practically limitless scope to the work of the sea in planing the land interiors.

Yet, apart from all these failures to be consistent and up to date the book has much to recommend it. Especially is the author to be complimented in making prominent dynamical rather than historical geology, for the latter can be taught in but few schools and the former can and should be taught in all. The author has set a standard of interest in expression, and quality of illustration, both by examples and pictures, that should be a guide to all the makers of future books on this subject or allied ones.

Drainage Modifications and Their Interpretation, by Marius R. Campbell, Geologist of the United States Geological Survey. (*Chicago Journal of Geology, Vol. IV., Nos. 5 and 6, pp. 567–581 and 657–678.*)

Mr. Campbell in his two papers on Drainage Modifications and Their Interpretation adds a very valuable and suggestive contribution to physiography, based upon a number of years' field work in the Southern Appalachians. He makes a plea—and a strong and sensible one—for the study of drainage lines concurrent with that of physiographic form in the interpretation of recent geographic history. The paper opens with a review of the well-known cycle of river development, and outlines the classes of drainage adjustments due to normal development, to rock character and structure, and to radial crustal movements of both continental and local characters.

Studying theoretically the effects of elevation and depression he formulates the law of migration of divides, that "if the movement is upwards the divide will tend to migrate toward the axis of uplift," and if conditions be long continued and favorable "it will reach the axial line and remain there." "If the movement is one of subsidence the divide will tend to migrate away from the axis, and will continue in that direction until the streams attain a condition of equilibrium. The migration of the divide away from the depression generally results in the formation of a stream along the axial line; and the direction in which it flows will depend, in a great measure, upon the pitch of the axis of the fold."

"It is probable that if such migrations have occurred in the past we can find some trace of the modifications thus produced and be able to determine the character, direction and extent of the movements; and from that form some idea of the physical conditions of the continent in late periods of geographical history."

The paper then considers the alignment of drainage affected by migration, and it is found that recent movements upward, if they be across the stream, are shown by barriers and change of grade; remote movements, to which the streams have had time to adjust themselves, are shown by the arrangement of minor streams, and very remote movements by the arrangement of trunk streams.

Turning now from the theoretical considerations to their application in the Southern Appalachians Mr. Campbell develops the reasons for considering the Mussel Shoals of the Tennessee as an indication of a recent uplift. He then considers the remote (probably Tertiary) uplifts attested by the drainage of the Kanawha, Big Sandy and Clinch rivers and the rivers of Kentucky. Finally, evidences of very remote movements are supposed to be seen in the alignment of a series of streams on the east of the Blue Ridge, "the arrangement of which appears to have been determined by the depression which preceded and made possible the deposition of the Triassic sediments of the eastern part of the United States: the Chattahoochee above Columbus, Georgia; the Savannah above Tallulah Falls; the French Broad above Asheville; and the upper portion of the Catawba and Yadkin rivers, occupying almost continuously a line from the margin of the Cretaceous sediments of the Gulf Coast to the Triassic deposits of the Don River area. The continuity of drainage suggests some common cause, for it seems highly improbable that their location along the line was simply fortuitous. Such an arrangement could have been brought about by a subsidence, the axis of which corresponds with the present drainage lines."

The paper as a whole is well illustrated by diagrams and examples; is clearly and logically expounded, and opens up a host of suggestive ideas to the modern student of physiography. It is a fit companion to the previous paper by the same author, in collaboration with Dr. C. Willard Hayes, on the Geomorphology of the Southern Appalachians, and one of the most valuable of recent contributions to scientific geography.

The Cruise of the "Antarctic" to the South Polar Regions. By H. J. Bull. With Frontispiece by W. L. Wyllie, A.R.A., and Illustrations by W. G. Burn Murdoch. Edward Arnold, London, 37 Bedford Street; New York, 70 Fifth Avenue. 8vo. 1896.

This modest narrative translates into prose the dithyrambic report of his voyage to Victoria Land laid before the Sixth International Geographical Congress by Mr. C. E. Borchgrevink. The expedition was the outcome of a design long meditated by Mr. Bull, and made feasible at last by the generosity of Commander Svend Foyn, who supplied the ship and the equipment.

The principal object was to search for right and sperm whales, but the study of natural phenomena was not to be neglected. Mr. Eivind Astrup and Mr. William S. Bruce, the naturalist of the *Balæna*, were expected to join the expedition, but they could not reach Melbourne in time, and Mr. Bull was glad to accept the companionship of Mr. Borchgrevink, who shipped as a "generally useful hand," with berth in the forecastle, there being no disposable space in the cabin. For the first two months, he did the ship's work, so far as it was required of him. After that time, he was allowed to do as he pleased, and but for subsequent events, adds Mr. Bull,

> I should be ashamed to enumerate the various ways in which I tried to show Mr. Borchgrevink the regard due to one gentleman from another (p. 108).

These subsequent events are said to be (on p. 213) Mr. Borchgrevink's arrogating to himself the credit for the results of the expedition, and his hurrying to London to the Geographical Congress, to read lectures and write papers, deriding his associates.

As an enterprise the voyage was unsatisfactory. The whales met with were not such as could be taken by the inexperienced crew of the *Antarctic*, and the right whales, found in vast numbers by Sir James Ross in the same waters, were not to be seen. Their disappearance is supposed by Mr. Bull to be due to relentless persecution, continued during many seasons by the whalers. To the same cause is ascribed the scarcity of the fur-seals in the Antarctic, and it is suggested that a great industry may be developed by an internationally accepted close season in those waters.

Mr. Bull explains the poverty of the additions made to natural science by the fact that there was no one on board the ship in possession of fair scientific attainments.

Five names were added to the chart: Cape Oscar, at the eastern point of Coulman Island; Svend Foyn Island, the northern island of Possession Group; Ross Island, the next one of the Group; Cape Von Mueller, the eastern cape of Possession Island; and Heftye's Island, the southernmost of the Possession Group. Mr. Bull repudiates the name of "Bull's Rocks," bestowed by Capt. Kristensen,

> As this kind of log-rolling and self-immortalization is particularly distasteful to me.

The book is well printed and handsomely illustrated.

A Table of the Geographical Distribution of American Indian Relics in a Collection exhibited in the American Museum of Natural History, New York; with Explanatory Text. By A. E. Douglass. Author's Edition, extracted from Bulletin of the American Museum of Natural History, Vol. VIII., Article X., pp. 199–220. New York, October 26, 1896.

This table, which must have cost a great deal of patient labour, classifies nearly 20,000 Indian relics, found in the different States of the Union and in various countries of North and South America. Most of the objects are of stone, but there are 78 of copper and 1,097 of hematite and iron ore. The arrow-heads are, of course, the most numerous, 8,396 in all, and 4,590 of these from the State of Missouri, while Connecticut, Iowa and Dakota show, each, but a single specimen.

Missouri stands first, also, in the number of stone celts, grooved axes, scrapers, knives and *bunts*, the collection having originally belonged to Mr. J. P. Jones, of Keytesville, in that State. According to a foot-note on p. 216, it was Mr. Jones who first used the word *bunts* to designate flints shaped into convenient forms for storage or transportation, but as yet unformed as finished implements.

Mr. Douglass has found the term in use as a synonyme for the blunt arrow-head, and he says that it does not appear as a dictionary word in any archæological sense; a rash statement to make in an age which sees a new dictionary with every new moon.

Of the existing confusion in the nomenclature of Indian relics he speaks as follows:

> The names given by collectors and essayists to the objects they describe render it quite impossible, without a figure, to conceive the nature of those objects. In the present collection . . . . a fixed nomenclature has been adopted based on the best authorities in American Archæology, except in a few instances where a more thorough study and later developments have shown the older designation to be erroneous (p. 219).

This seems to mean that Mr. Douglass's judgment is, in a few instances, better than that of the best authorities; a dark saying not unlike that of the critic who declared that a portrait was more like than the original. Considering the ways of the collectors and essayists, including Mr. Douglass, it must be admitted, as he suggests, that the Anthropological Section of the American Association for the Advancement of Science would do well to strengthen the hands of the best authorities in this matter of nomenclature.

NOTES AND NEWS.

A New Science Association.—On July 8, 1896, a New York State Science Teachers Association was organized at Buffalo, N. Y. with the object of promoting science teaching, and bringing about the better acquaintance of the science teachers of the State. Prof. Simon H. Gage was elected President; Prof. Chas. W. Harglitt, Vice-President; and Prof. Franklin W. Barrows, 45 Park St., Buffalo, Secretary and Treasurer. An advisory council of fourteen was later appointed by the elected officers, and the first meeting for permanent organization will be held at Syracuse on Dec. 30 and 31, 1896.

Discussion under leadership of well-known men, authorities in their respective subjects, will be upon the present position of science teaching in the secondary schools, and upon the best methods of improving both the quantity and quality thereof. It is hoped that some progress may be made upon the question of how to improve the science in the preparatory schools so as to make the colleges recognize science for admission. If this can be accomplished the colleges will be required in many cases to improve their science curriculum to keep up with the times.

For purposes of discussion the sciences have been grouped in three natural divisions—the physical, earth, and biological sciences. Under the first division will be included physics and chemistry; under the second, physiography and geology; under the third, zoology, botany and physiology. Each division will be allowed a half day in the meeting, and it is hoped that a good beginning may be made upon the important problems that the association has to face.

A New Geographical Journal. — Mr. Richard E. Dodge, Associate Professor of Natural Science at the Teachers College, New York City, will start a Journal of School Geography in January. The aim of the Journal will be to give all that is newest and best in geography in such a way as to be readily used by the common school teacher.

In each number it is proposed to have two or three short papers on topics of special interest to teachers, and written by experts. The larger part of the paper will be devoted to summaries and notes that will try to state in a helpful way the materials now scattered at large in many magazines, most of which are not of ready access to teachers. All geographic materials directly helpful to teachers will be reviewed critically, and in every possible way the direct needs of the teachers will be served. The Journal will appear ten times a year for the sum of one dollar, and subscriptions should be sent to *The Journal of School Geography*, 41 Queen Street, Lancaster, Pa.

Mr. Dodge will be assisted in his undertaking by the following associate editors:

W. M. Davis, Professor of Geography, Harvard University, Cambridge, Mass.; C. W. Hayes, Geologist, U. S. Geological Survey, Washington, D. C.; H. B. Kummel, Associate Professor of Physiography, Lewis Institute, Chicago, Ill.; F. M. McMurry, Dean School of Pedagogy, University of Buffalo, Buffalo, N. Y.; R. deC. Ward, Instructor in Climatology, Harvard University, Cambridge, Mass.

THE STUDY OF GEOGRAPHY OF NEW YORK STATE IN SCHOOLS. —The Board of Regents of the University of the State of New York are to issue soon a pamphlet by Professor William Morris Davis, of Harvard, setting forth the map material on New York State that can be readily used by teachers in the lower schools. This pamphlet is a companion one to those already issued by the same author on Rhode Island and Connecticut and should be a valuable help to teachers. Copies will be sold by the Regents for a nominal sum, probably about five cents each.

Professor Davis has also accepted an invitation to speak at the next Convocation of the Regents, on the present position of geography in teaching.

The following notice has been received:

CENTENARY OF INDIA CENTRAL EXECUTIVE COMMITTEE.—We have the honour to inform you that the postponement of the celebration of the fourth centenary of the discovery of the maritime route to India, by Vasco da Gama, from July, 1897, the anniversary of his sailing from Lisbon, until May, 1898, the aniversary of his arrival at Calicut, having been rendered necessary, in consequence of the shortness of time and for other reasons, it has been decided to await further decisions of Parliament, which meets early in January.

Our committee, authorized by the Portuguese Government, will duly communicate to you the precise date of the celebration and any alterations in the programme that may be decreed by Parliament, and we trust that we may continue to rely upon your valued support, in order that the results of our undertaking may be in harmony with the remarkable feat of universal history which the Portuguese Government desires thus to commemorate.

Central Executive Committee of the Fourth Centenary of the Discovery of India, Lisbon, 26th October, 1896. The President—F. J. Ferreira do Amaral. The Secretaries—Luciano Cordeiro, Ernesto de Vasconcellos.

ACCESSIONS TO THE LIBRARY.

October–December, 1896.

BY PURCHASE.

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Report on Crime, Pauperism and Benevolence at the Eleventh Census, 1890, Part I, Analysis; Report on Farms and Homes: Proprietorship and Indebtedness in the United States at the Eleventh Census, 1890; Report of the Commissioner of Railroads to the Secretary of the Interior for the Fiscal Year ended June 30, 1896.

From the Interstate Commerce Commission, Washington:

Statistics of Railways in the United States. Advance Copy, without Appendix C and the six Statistical Tables.

From the National Geographic Society, Washington:

National Geographic Magazine, Vol. VII, 1896, Nos. 10, 11, 12.

From the U. S. Navy Department, Washington:

Notes on the Year's Naval Progress, July, 1896.

From the U. S. Office of Library and Naval War Records, Navy Department, Washington:

Proceedings of the U. S. Naval Institute, Annapolis, Vol. XXII, No. 3; Report of the Surgeon-General, U. S. Navy, to the Secretary of the Navy, 1896.

From the Philosophical Society of Washington, Washington:

Bulletin, Vol. 12, 1892–1894.

From the Department of State, Washington:

Consular Reports, Nos. 193, 194; Special Consular Reports, Vol. XIII, Part I, Money and Prices in Foreign Countries, etc.; List of books, pamphlets and maps received at the Library of the Department of State, Jan. 1 to June 30, 1896. (No. 13.)

From the Weather Bureau, Washington:

Monthly Weather Review, July, August, September and October, 1896; Report of the International Meteorological Congress held at Chicago, Ill., Aug. 21–24, 1893, Part III, Bulletin No. 11.

From the Nassauische Verein für Naturkunde, Wiesbaden:

Jahrbücher, Jahrgang 49, 1896.

From the American Antiquarian Society, Worcester, Mass:

Proceedings, New Series, Vol XI, April 29, 1896.

From the Worcester Society of Antiquity, Worcester, Mass.:

Proceedings for the year 1895 (Part 11 of Vol. XIV), Worcester Births, Marriages and Deaths, Part III, Deaths.

THE CULLUM GEOGRAPHICAL MEDAL.

At a meeting of the Council of the American Geographical Society, held on the 5th of December, 1896, the design for the Cullum Geographical Medal, submitted by Miss Lydia Field Emmet, was adopted, and the sinking of the die has since been entrusted to Mr. Victor D. Brenner. The Council at the same meeting by unanimous vote awarded the medal to Civil Engineer R. E. Peary, U. S. N., for his expedition of the year 1892, which determined the insularity of Greenland.

This is the first award made from the fund devised by the late Gen. George W. Cullum, U. S. A., according to the terms of his will, as follows:

> " Thirty-ninth, I give and bequeath to the American Geographical Society, in the City of New York, the sum of Five Thousand Dollars to establish a permanent fund for the purposes comprehended in the general objects of its charter, that is to say: to apply the income to procuring a die, with suitable devices and inscriptions, and to cause gold medals to be struck thereupon and presented from time to time by the said Society to those who distinguish themselves by geographical discoveries, or in the advancement of geographical science, particularly citizens of the United States of America, it being understood that the selection of the recipients of the medals shall be chosen with the assent of not less than two-thirds of the entire Council of the Society, the vote thereon to be taken by ayes and nays, which must be recorded in the proceedings of the Council. I further direct that any losses of any part of this permanent fund shall be made good by the accumulation of the income of the remainder before any further expenditures for medals shall be made. I further direct that this medal fund shall be called the Cullum Geographical Medal Fund."

TRANSACTIONS OF THE SOCIETY.

NOVEMBER–DECEMBER, 1896.

A Regular Meeting of the Society was held at Chickering Hall, corner of Fifth Avenue and Eighteenth Street, on Monday, November 16, 1896, at 8.30 o'clock P.M.

President Daly in the chair.

The following persons, recommended by the Council, were elected Fellows of the Society:

O. J. Edwards,	Hamilton L. Hoppin,
W. L. Atkin,	Frank G. Nelson,
Townsend McCoun,	Edward L. Tilton,
Caleb Tyler Ames,	Miss C. W. Hotchkiss,

St. Croix de la Roncière.

The President then introduced the speaker of the evening, Col. Henry G. Prout, formerly of the Egyptian army, who delivered an address on the Sudan, its recent History, and the Campaign of 1896.

On motion, the Society adjourned.

A Regular Meeting of the American Geographical Society was held at Chickering Hall, corner of Fifth Avenue and Eighteenth Street, on Monday, December 14, 1896, at 8.30 o'clock P.M.

Vice-President Moore in the chair.

The Chairman introduced to the Society Mr. Heli Chatelain, who read a paper, illustrated by stereopticon views, on the Internal Slave Trade in Africa.

On motion, the Society adjourned.

INDEX TO VOL. XXVIII.

PAGE

Academy Glacier.................. 34
Accessions of Territory 253
Accessions to the Library, 80, 200, 309, 440
Adams, Maj. H. M., Outline Map of the United States, *noticed*..... .. 183
Adirondack Province.............. 109
Admission of the States........... 254
Aerial Navigation, Propositions concerning 51
Africa, A Naturalist in Mid-, by G. F. Scott Elliot, *noticed*.......... 305
—— East British Protectorate..... 398
—— German East Agricultural Experiment Station in............. 398
—— Internal Slave-Trade in...... 71
Afrika, Ukambani und dem Kenia-Gebiet, map of, *noticed*.......... 425
Africa, Zones of Altitude in Central 283
African Natives, Will they Work for Hire? 167
Alaska, American Claim in........ 144
—— and Arctic Regions, U. S. Coast Survey Publication 178
—— Boundary............45, 297, 414
—— British Claim in............. 144
—— Cession of................... 140
—— Geographical Notes in. By Wm. H. Dall. *With map*....... 1
—— Gold and Coal Resources of... 179
—— Mountaineering in. By Israel C. Russell. *With map*......... 217
—— Russian Charts of 5
—— Yukon Region, Gold in the... 392
—— Yukon River, Post Office on.. 414
—— Yukon River, Trade on the... 393
Alaskan Boundary, The. By Marcus Baker. *With maps*............. 130
Albatross in Bering Sea 418
Aleut Maps...................... 5
Alluvial Cones in California........ 423
Amalik Harbor, Aliaska Peninsula.. 15
America, Central, Confederation of. 418
—— North, Chart of the West Coast, issued by the U. S. Hydrographic Office, *noticed*................. 298
American Antarctic Expedition not sent 67
—— Association, Fiftieth Anniversary, 1898................ 250
—— Association, Forty-fifth Meeting 244

PAGE

American Association to Meet at Detroit, 1897................... 250
—— Claim in Alaska 144
—— Institute of Archæology, A Washington Branch of.......... 52
—— Naturalist in Africa.......... 168
Americanistas, Undecimo Congresso Internacional de, *noticed* 305
Amu-Daria, Diversion of 398
"Ancient Monuments of the Mississippi Valley." By E. G. Squier and E. H. Davis, *noticed*........ 291
Andree Returns Home. 278
Andree's Balloon Expedition, 65, 171, 403
Angola, Carta de Benguella e Mossamedes, *noticed*................ 187
Animal Life not found by Nansen.. 276
Annuaire Géologique et Minéralogique de la Russie, rédigé par N. Krichtafovitch, *noticed*.......... 196
Antarctic Research, Proposed Belgian.......................... 403
Antarctica, Icebergs in........... 404
Archives, Revolutionary, Publication of........................ 51
Arctic Currents.................. 276
—— Highlanders, Influenza among. 279
—— Journey, Nansen's........... 273
—— Regions, The new map of, *noticed*......................... 179
—— Soundings, Nansen's voyage.. 275
Argentine Explorations........... 395
—— Republic. Mapa Cadastral de Corrientes, *noticed*.............. 185
—— Republic, Population of the... 396
Arizona Organized, 1863.......... 268
Arkansas Part of Missouri Territory 259
Armenians in Asiatic Turkey and Transcaucasia.................. 58
Artesian Basin of the North West, Gradient of, J. E. Todd, *noticed*. 250
Artesian Well Sunk at Key West, E. O. Hovey, *noticed*.............. 250
Article 1, of the Alaska Cession Treaty.... 140
Atlantic Coast, Chart issued by the U. S. Hydrographic Office...... 298
Atlas, Topographic, of the United States, *noticed*..... ....181, 419
Attack upon Dr. Herrmann Meyer in Brazil...................... 281
Augustin Island (Black Fox)...... 9

PAGE

Baird, Prof., Reports of Geographical Explorations, *noticed*........ 294
Baker, Marcus, The Alaskan Boundary. *With maps*............... 130
Balloon Journey, S. A. Andree's... 171
Baltic Sea, Origin of the....... .. 163
Baulx, Count H. de la, in Patagonia........... 281
Bean, Tarleton H., and Dr. G. Brown Goode, on Oceanic Ichthyology..................... 297
Berendt, Dr. H., in Yucatan, 1866.. 293
Bering, Expedition of.... 136
Berlandier, Louis, Researches in Mexico....................... 292
Bifurcations in South American Rivers........................ 56
Black Fox Island (Augustin)....... 9
Blanket the unit of value, North Pacific Coast.................... 234
Blue Hills Reservation, Topographical Map of.................... 184
Bluzet, Lieut., his account of Timbuktu Lakes.................. 62
Board of Irrigation in the U. S.... 41
Board on Geographic Names, The U. S......................... 49
Boas, Franz. The Indians of British Columbia.................... 229
Bogotá to the United States, Journey from.................... 282
Bolivia, Chili's Treaty with........ 396
Book Notices.........72, 189, 299, 428
Boundary, Alaska.....45, 130, 297, 414
—— Northern, of the U. S... 47
Brazil Still Holds Trinidad........ 281
Brigham, Albert Perry, The New Geography, *noticed*............. 195
Brinton, D. G., Resolution on the White Race in the U. S......... 248
British Claim in Alaska........... 144
British Columbia, The Indians of. By Dr. Franz Boas............. 229
Brower, J. V., Survey of Sources of Missouri River................ 157
—— The Utmost Waters of the Missouri River. *With map*......... 387
Buddhist Sacred Tree............. 288
Bull, H. J., Cruise of the *Antarctic* to the South Polar Regions, *noticed*......................... 434
Bureau of Ethnology, 14th Annual Report........................ 49
Busumakwe Lake, Ashanti........ 285
Cable, Pacific..................44, 177
Cabot, Discovery of America by John, in 1497, *noticed*........... 303
Caches, Failure to find (R. E. Peary's)...................... 25
California, Alluvial Cones in....... 423
California, Southern, defined....... 421
—— the Garden of............... 422

PAGE

Campbell, Marcus R., Drainage Modifications and their Interpretation, *noticed*... 433
Canada, Discovery in............. 55
—— Franklin District............ 393
—— Keewatin District........... 394
—— Mackenzie District........... 394
—— New Districts in............ 393
—— Ungava District............. 393
—— Yukon District........... .. 394
Canal between the Great Lakes and the Atlantic.................. 42
—— between the Great Lakes and the Ohio and Mississippi Rivers.. 42
—— Chesapeake and Delaware Bays 175
—— connecting Puget Sound and Lakes Union and Washington.... 173
—— from Lake Michigan to the Wabash River................. 43
—— from the Great Lakes to New York........................ 174
—— from the Great Lakes to the Hudson...................... 42
—— Lake Michigan and Wabash River....................... 175
—— Lake Superior and Mississippi River........................ 173
—— Nicaragua.................. 174
Cape Douglas (Cook's Inlet)....... 8
Cape Yaklok..................... 16
Casiquiare River................ 56
Caspian, Diverting the Amu-Daria to the......................... 398
Castle Bay...................... 19
Catalogue of 16,748 southern stars, *published*..................... 296
Catskill Province................ 105
Celebes, Lakes Explored in 283
Census, Eleventh, Complete list of Publications.................. 416
—— inquiries, uniformity in and plan proposed...............52, 415
—— Methods................... 415
Chaix Hills................. .. 221
Chanler, William Astor, Through Jungle and Desert, *noticed*...... 191
Chapman, Pike, discovered Colossal Cavern......................... 248
Chart, Hydrographic, of submarine cables..................... .. 177
—— of the West Coast of North America, Hydrographic Office, *noticed*...... 298
—— Applegate, of Alaska........ 6
—— Russian, of Alaska........ . 5
—— U. S. Coast Survey, of Alaska. 8
Chasik Island................... 11
Chesapeake and Delaware Bays Canal........................ 175
Chignik Bay..................... 17
Chili, Treaty with Bolivia......... 396
Chilian Andes, Expedition to the.... 395

PAGE
Chimborazo, the highest point of a camp-fire on 217
Circle City (upper Yukon), Post Office at 414
Claypole, E. W., on Human Relics in the Drift of Ohio 249
Climate, Mexico 335
Climate of New York State 125
Coal, brown, at Kachekmak Bay 14
Cold Bay (Studenaia) 16
Collisions at sea, Rules to prevent, to be put in operation, July 1, 1897 418
Colossal Cavern, a new cave 247
Columbia University Geographical Lectures 406
Commander Islands and Bering Sea 414
Commission on Highways 52
Congo, Carte de l'Etat Indépendant du, *noticed* 185
Congo Français, map of, *noticed* 184
Congo Railroad 167
Conquest of the Country Northwest of the River Ohio, etc. By William Hayden English, *noticed* 73
Continent of America, The. Its Discovery and Its Baptism. By John Boyd Thacher, *noticed* 193
Contributions to the Physical Geography of the United States. By Charles Ellet, Jr., *noticed* 291
Convention, in 1824, between Russia and the United States 139
Cook, Captain, Outlines Alaskan Coast 137
Cook's Inlet, Tides in 12
Copan, Honduras, Prehistoric Ruins of, *noticed* 301
Cora, Guido. Il Territorio Contestato tra la Venezuela e la Guiana Inglese, *noticed* 308
Coral Island Expedition 287
Corn, Kafir, in the U. S. 392
Cornell Party at Melville Bay 402
Coronado's Journey to Cibola 49
Cripple Creek District 43
Cruise of the "Antarctic" to the South Polar Regions. By H. J. Bull, *noticed* 434
Cuba, Mapa de la Isla de, *noticed* 425
Cullum Geographical Medal, The 454
Daghestan, Dagestan und das Tiefland, map of, *noticed* 425
Dakota Territory formed, 1861 265
Dall, Wm. H. Geographical Notes in Alaska. *With map* 1
—— on the "Jeannette" Relics 63
Danube, Iron Gates of the 397
Danube Ship Canal 162
Davis, William T. Staten Island Names, *noticed* 196

PAGE
Dawson, Samuel Edward. The Discovery of America by John Cabot in 1497, *noticed* 303
Découverte du Pôle Nord, La, Par Eugène Payart, *noticed* 198
Deep Water-ways 42
Delaroff Harbor 19
Department of State, publication of the Revolutionary Archives in the 51
Desiccation of Central African Lakes 166
Determination of points, Astronomical, Nansen's voyage 276
Discovery in Canada 55
Discovery of America by John Cabot in 1497. By Samuel Edward Dawson, *noticed* 303
District of Columbia ceded by Maryland 256
Dodge, Richard E. Aids in the Study of Geography 408
—— founds a new Geographical Journal 437
—— Geography from Nature 146
Doris Cove 19
Douglass, A. E. Geographical Distribution of American Indian Relics, *noticed* 436
Drainage Modifications and their Interpretation. By Marcus R. Campbell, *noticed* 433
Drainage of New York State 111–115
Dryad, Hudson Bay Co., ship 143
Dwarfs, East African 164
Earth and its Story, etc. By Angelo Heilprin, *noticed* 431
Earthquake in Iceland indicated in Paris 410
—— Mischievous Prophecy of 289
Ekroll's Winter in Spitzbergen 64
Elementary Physical Geography. By Ralph S. Tarr, *noticed* 72
Ellice Islands, Expedition to the 409
Elliot, D. G. Expedition in Somaliland 168, 397
Emerson, B. K. Address on Geologic Myths, *noticed* 244
England, Erosion on the Coasts of 58, 396
English, William Hayden. Conquest of the Country northwest of the River Ohio, *noticed* 73
Eritrea, The Future of 168
Eskimos, Graphic Arts of the, work announced 298
Ethnology of Mexico 348
Faguibine, lake near Timbuktu 62
Failure to find caches (R. E. Peary's) 25
Fairweather Alps 3
Féral, Gaston. Observations Météorologiques sur les Pluies Générales et les Tempêtes, *noticed* 195

PAGE

Fire Island........................ 13
FitzGerald, E. A., discovers Pass in the New Zealand Alps.......... 405
Fletcher, Miss Alice C. Emblematic use of the Tree in the Dakotan Group, *noticed*................ 245
Floridas, The.................... 252
Forest Reservation in New York State........................ 394
Forest Reservations in U. S........ 38
Forestry Commission in U. S...39, 180
Fouilon-Norbeck, Baron von, killed. 410
Fram, arrived at Norway, Aug. 20, 1896.......... 274
—— left Vardö July 21, 1893...... 273
—— Strength of the........... .. 277
Franz Joseph Land, Mr. Jackson's work in...................... 400
Franz Josef Land, Payer's Map of.... 402
French Protectorate of Futa-Djallon. 284
Frœbel, Julius. Remarks Contributory to the Physical Geography of the North American Continent, *noticed*...................... 292
Fundy, Bay of, Tides of the....... 394
Futa-Djallon, French Protectorate of......... 284
Gadsden Purchase....... 253
Gannett, Henry. A Graphic History of the United States. *With maps*... 251
Gannett, Henry, Geographer, U. S. Geol. Survey.................. 180
Gannett, Henry. Topographic work of the U. S. Geological Survey in 1895. *With map*.............. 323
Geikie, Sir Archibald, receives medal from the Royal Society.......... 409
Geographic Aids................. 408
Geographic Names, U. S. Board on.......................... 49
Geographic Positions in Massachusetts, Coast Survey publication.. 178
Geographic Provinces of New York State........................ 110
Geographical Congress, Report of the Sixth International, *noticed*... 299
—— Distribution of American Indian Relics, etc. By A. E. Douglass, *noticed*...................... 436
—— Journal, R. E. Dodge founds a new 437
—— Methods.................... 287
—— Notes in Alaska. By Wm. H. Dall 1
—— Results of Nansen's Voyage.. 274
—— Results of the Geological Survey of Canada in 1895.......... 159
—— Society of the Pacific. An Examination into the Genuineness of the "Jeannette" Relics, *noticed*.. 189

PAGE

Geographical Society of the Pacific to aid Explorer Andrée.......... 66
—— Teaching in Great Britain.... 287
Geography, Elementary Physical. By Ralph S. Tarr, *noticed*....... 72
—— from Nature. By Richard E. Dodge......................... 146
—— Physical, of New York State. By Ralph S. Tarr. *With maps*.. 99
Geologic Myths. Address by B. K. Emerson, *noticed*............... 244
Geological Development of New York State..................... 116
—— Evidence of Glacial Man at Trenton. By G. F. Wright...... 249
—— Expedition to Novaya Zemlya. 163
—— Observations, Nansen's Voyage 275
—— Survey of Canada in 1895..... 159
Geology of Mexico............... 330
Georgia, Original Extent of....... 257
German South Polar Expedition.... 67
Glacial Lake Agassiz.............. 295
—— Lake Beaches, Buried timber in 280
—— Man, Evidence of, at Trenton.............. 249
Glacier, Academy................ 34
Gilliss, J. M. Report of U. S. Naval Expedition, 1849–52, completed.. 296
Gneissic Highland Province........ 102
Goode, Dr., G. Brown and Tarleton H. Bean on Oceanic Ichthyology. 297
Grand Lac Victoria, Latitude and Longitude of.................. 55
Graphic History of the United States, A. By Henry Gannett... 251
Great Lakes and the Atlantic Ocean, Water-way between............. 418
—— Influence on climate of New York.......................... 128
—— to New York, Canal from the.. 174
Greenland Continental Ice Divide.. 29
—— Peary's Conclusions as to work in 36
—— Peary's next Expedition to.... 170
—— Peary's Return from......... 278
—— Regularity of winds of the "great ice" in................ 30
—— Route to the Pole............ 279
—— Work in North, in 1894 and 1895. By Civ. Eng. R. E. Peary, U. S. N. *With map*.......... 21
Grewingk, volcano 20
Guanajuato, Temperature......... 342
—— Veta Madre Lode.......... . 355
Guinea. Le Transnigérien, etc., map of, *noticed*................ 426
Gulf Stream, Relations of the, and the Labrador Current. By William Libbey, Jr., *noticed*............ 302
Hague, Arnold, Survey in the Yellowstone National Park......... 412

PAGE

Hall, Prof. James. Sixtieth Anniversary of his connection with the Geological Survey of the State of New York 247
Hansen Search for Nansen 277
Hausa States 285
Hayes, C. Willard. Lecture on the Mountains of Alaska 407
Hedin, Dr. Sven, in region of Lobnor 399
Heilprin, Angelo. The Earth and its Story, *noticed* 431
Herbertson, Andrew J., on Map Projections 405
Heure Décimale, L', et la Division de la Circonférence. Par Henri de Sarrauton, *noticed* 197
Hill-Caves of Yucatan, by Henry C. Mercer, *noticed* 76
History of the States 253
Hitchcock, Edward, engaged in Researches on Erosions 292
Hoffman, W. J. The Menomini Indians, *noticed* 49
Hoffman, W. J. Work on the Graphic Arts of the Eskimos announced 298
Hollanders, Map of the Principal Voyages, etc., *noticed* 186
Honduras, Recent Explorations in. F. W. Putnam 249
Hovey, E. O. Artesian Well at Key West, *noticed* 250
Hovey, Horace C. The Making of Mammoth Cave, *noticed* 247
Hübner, Georg, on the Casiquiare River 56
Human Relics in the Drift of Ohio. By E. W. Claypole, *noticed* 249
Hydrography of Mexico 334
Hydrography, Plankton and 404
Hydrology of the Mississippi 280
Hygiene, Nansen's Voyage 276
Ice Invasion in New York State 124
Ichthyology, Oceanic 297
Idaho formed in 1863 270
Iliamna, Volcanic Peak 11
Illinois Territory organized in 1809. 261
Illustration. Crossing Malaspina Glacier; A Moment's Rest 221
—— Tūliŭm'nit Point, Chignik Bay 18
Illustrations. Utmost Waters of the Missouri River 391
Il Territorio Contestato tra la Venezuela e la Guiana Inglese, etc. Guido Cora, *noticed* 308
Independence Bay Land 33
Independence Bay, Profiles between Whale Sound and 29
Indian Feast Song 234
—— Love Song 234
—— Music not Unmeaning 233

PAGE

Indian Relics, Geographical Distribution of American, etc. By A. E. Douglas, *noticed* 436
—— Reservations in United States. 38
—— Territory, The Survey of 180
—— Tribes of Mexico 348
Indiana Territory in 1800 260
Indianola Territory proposed 52
Indians, Menomini. By. Dr. W. J. Hoffman, *noticed* 49
—— Mexican, Resemble Malay Races 349
—— North Pacific Coast, Artificially Deform their Heads 230
—— N. P. Coast. Blanket the Unit of Value 234
—— N. P. Coast, Hair of 230
—— N. P. Coast, System of Credit. 234
—— of British Columbia, The. By Dr. Franz Boas 229
—— Seri, visited 47
Influenza among Arctic Highlanders 279
Iowa Territory organized, 1838 263
Irawadi, Sources of the 60
Irrigation, Board of, in the United States 41
—— Survey, a Division of the United States Geological Survey.. 412
Iron Gates of the Danube 397
Isothermal line through New York. 126
Jackson in Franz Josef Land...277, 400
Jalapa, Temperature 342
Japan, Progress in 169
"Jeannette" Relics, Examination into the Genuineness of the, *noticed* 189
"Jeannette" Relics, so-called 63
Jesuit Relations and Allied Documents, The, etc. Edited by Reuben Gold Thwaites, *noticed*.. 428
Kachekmak Bay 14
Kachekmak Harbor 15
Kafir corn in the U. S 392
Kansas Territory organized, 1854.. 267
Kemp, James F., lecture on Rocky Mountains 406
Kenia, Mount 168
Kialagvit Bay 17
Kohl, Dr. J. G., on Charts and Maps of America, *noticed* 293
Krichtafovitch, Annuaire Géologique et Minéralogique de la Russie, *noticed* 196
Kumlein, Dr. L., Explorations in Greenland, *noticed* 293
Kushk, Railroad from Merv to 282
Kwakiutl cannibal legend 236
—— feast 233
—— ghost dance 240
—— secret societies 238
—— songs 234

PAGE

Kwakiutl speech quoted.......... 232
—— tales, sometimes borrowed.... 242
—— tribe 231
—— war dances 239
Labrador Current, Relations of the Gulf Stream and. By William Libbey, Jr., *noticed*............... 302
Labrador, Expedition to explore... 54
Lake Faguibine 62
Lake Michigan and Wabash River Canal........................ 175
Lake Shore Plains Province........ 107
Lake Superior and Mississippi River Canal........................ 173
Lake Waswanipi................ 55
Lakes, Central African, Desiccation of 166
Lakes of New York.......... ... 111
Lakes of North America. By Israel C. Russell, *noticed*.. 77
Languages of North Pacific Coast.. 231
Lapparent, Albert de. Leçons de Géographie Physique, *noticed*.... 193
Leon, Temperature of....... 342
Libbey, William, Jr. The Relations of the Gulf Stream and the Labrador Current, *noticed*..... 302
Littledale, Mr. and Mrs. George, in Tibet 61
Lob-nor, Lake District of......... 399
Long Island Province............. 102
Louisiana admitted, 1812.......... 258
Louisiana Purchase............... 251
McParlin, T. A. Notes on New Mexico, *noticed* 293
Malaspina glacier................ 220
Mammoth Cave, The making of.... 247
Mammoth Skeleton found near Tomsk 283
Map. Aggattu Island............. 7
—— Agricultural, of Tennessee, *noticed*...................... 424
—— Alaska and Adjoining Region. 132
—— Alaska, Southeastern, from a recent Coast Survey Chart....... 133
—— Alaska, S. E., from Vancouver's Atlas, 1798.. 134
—— Arctic Regions, with tracks of search parties, etc., *noticed*...... 188
—— Arizona..................... 268
—— Arkansas.................... 259
—— Carta del Teatro della Guerra Nel Sudan Egiziano, ecc., *noticed*. 187
—— Carta Stradale ed Industriale di Macerata, ecc., *noticed* 187
—— Carte de l'Etat Indépendant du Congo, *noticed*................. 185
—— Chignik Bay, Alaska Peninsula. 18
—— Congo Français, Carte du, *noticed*. 184
—— Costa Oriental de Moçambique. 187
—— Cuba, Isla de, *noticed*........ 425

PAGE

Map, Dagestan und das Tiefland, *noticed*.................... ... 425
—— Dakota, North and South..... 266
—— Georgia..................... 257
—— Ground, of the United States. 175
—— Guinea, French. Le Transnigérien, etc., *noticed*.......... 426
—— Idaho....................... 270
—— Illinois..................... 261
—— Indiana................. .. 260
—— Iowa 264
—— Kansas...................... 267
—— Louisiana.................... 258
—— Mapa Cadastral Gráfico de la Provincia de Corrientes, República Argentina, *noticed*.............. 185
—— Mappe of the Principal Voyages and Discoveries made by the Hollanders, etc.................... 186
—— Massachusetts............... 255
—— Michigan.................... 262
—— Minnesota.................. 263
—— Mississippi............... . 257
—— Missouri............... 265
—— Missouri River, Hydrographic and Topographic Chart of the Utmost Source of the. *Facing*... 387
—— Mount St. Elias Region, Sketch Map of. *Facing*.............. 217
—— Nebraska................. 266
—— Neue Special-Karte der Südafrikanischen (Transvaal) Republik, etc., *noticed*............... 186
—— Nevada..................... 269
—— New Hampshire, Central White Mountains, *noticed*............. 423
—— New Jersey relief, *noticed*..... 423
—— New Mexico... 268
—— New York State............. 256
—— New York State, Geological Sketch of...................... 117
—— New York State, showing Provinces......................... 100
—— New York State, Topographical Sketch of...................... 101
—— Nile. Formes de la Vie dans le Haut Nil, *noticed*........... 426
—— Notices................ 181, 419
—— Ohio........................ 259
—— Oklahoma................... 267
—— Oregon..................... 271
—— Outline, of the United States and Territories, *noticed*......... 183
—— Pamir, Division of, *noticed*.... 426
—— Persien, Reisen in Nord und Zentral, *noticed*............... 425
—— Plano General del Camino Central del Perú del Callao al Ucayali, etc., *noticed*................ 187
—— Provincia de Angola. Carta dos districtos de Benguella, e Mossamedes, *noticed*............ 187

PAGE

Map. Russie d'Europe, etc. Carte Hypométrique, *noticed*. 425
—— Schizzo del Teatro della Guerra Italo-Abissina, *noticed*. 186
—— Texas. 258
—— Topographical, of Middlesex Fells, *noticed*. 184
—— Topographical, of the Blue Hills Reservation, *noticed*. 184
—— Ukambani and the Kenia, *noticed*. 425
—— United States. Plate No. 1, Showing accessions of Territory. *Facing*. 252
—— United States. Plate No. 2. *Facing*. 271
—— United States. Plate No. 3, Distinguishing States not materially changed since formation. *Facing*. 272
—— United States. Progress of the Topographic Map of the. *Facing*. 323
—— United States showing the Distribution of Lands. By F. H. Newell, *noticed*. 182
—— Utah. 269
—— Venezuela, Botanical, *noticed*. . 425
—— Virginia and West Virginia. . . 256
—— Washington. 271
—— Whale Sound, Greenland. *Facing*. 21
—— Wisconsin. 262
Maps, Topographical, in geography classes. 161
—— Topographical, in schools. . . . 286
—— U. S. Topographical, *noticed*. . 419
Marine Conference proposed. 51
Marine Types in Lake Tanganyika. 284
Maryland Geological Survey. 157
Massachusetts, Geographic Positions in, Coast Survey publication. 178
—— originally included Maine. 255
Mazatlan, Temperature. 343
Mekong River navigated. 283
Melville Bay, Cornell Party at. 402
Memoirs of the Peabody Museum, Vol. I, *noticed*. 301
"Menomini Indians." By Dr. W. J. Hoffman, *noticed*. 49
Mercer, Henry C. The Hill-Caves of Yucatan, *noticed*. 76
Merida, Temperature. 343
Merv, Railroad from, to Kushk. . . . 282
Meteorological conditions in Mexico, Table of. 341
—— observations, Nansen's voyage. 276
Metric System. 176
Mexican Boundary. 411
—— Cession, First. 252
Mexico and Central America. 330
Mexico, Area and Population Table. 351
—— Area of. 327

Mexico, Army of 365
—— as a Sanitarium. 343
—— Banking in. 384
—— Bays, principal. 335
—— Birds of. 347
—— Boundaries of. 327
—— By Matias Romero. 327
—— Cactus, many species. 346
—— Central Plateau. 333
—— City of. 354
—— City of, Temperature. 342, 355
—— Climate, diversity of. 337
—— Coinage of Gold and Silver in. . 357
—— Cold Zone. 340
—— Debt of. 386
—— Education in. 353
—— Ethnology of. 348
—— Exports, Table of. 369
—— Fauna of. 346
—— Fauna of Pacific Islands of, different. 348
—— Flora of. 344
—— Geology of. 330
—— Gold Production small. 357
—— Guano. 348
—— Gulfs of. 334
—— Harbors on the Gulf Coast. . . . 334
—— Hot Zone. 338
—— Hydrography. 334
—— Imports, Table of. 368
—— Indian Tribes of. 348
—— Insects in Hot Regions. 347
—— Islands. 335
—— Lakes of. 335
—— Languages. 350
—— Location, Boundaries and Area 327
—— Meteorological Conditions, Table of. 341
—— Minerals of. 332
—— Mining in. 355
—— Mints in. 356
—— Mountains, Table of. 334
—— Newspapers in. 354
—— Orange Trees in. 345
—— Orography of. 332
—— Paper Money in, and Table. . . 383
—— Patio System in Mining 356
—— Pearl Oysters in. 348
—— Political Organization. 364
—— Population Densest on Central Plateau 350
—— Population of. 280, 350
—— Railroad, First, Built 1854. . . . 359
—— Railways in. 359
—— Railways, Tables of. 361
—— Religion in. 352
—— Revenues and Expenses, Table of 366
—— Rivers of. 335
—— Silver Exported, Table of 358
—— Temperate Zone. 339
—— Tobacco in. 345

PAGE

Mexico. Trade between Mexico and the U. S., 1889–1896, Table of 378
—— Transactions between Mexico and the United States, Table of 371
—— Travelling in 329
—— Valley and City of 354
Meyer, Dr. Herrmann, Attack upon 281
Michigan Territory organized in 1805 261
Middlesex Fells, Topographical Map of 184
Military Reservations 39
Mineral Resources of the United States, 1894 44
Minerals of Mexico 332
Minnesota organized, 1849 263
Mississippi, Extent of 257
—— Hydrology of the 280
Missouri River, Geographic Names at the Source of 390
—— Utmost Source of the 157
—— Utmost Waters of the. By J. V. Brower. *With map* 387
Missouri Territory part of the Louisiana Purchase 264
Moçambique, Costa Oriental de. Map *noticed* 187
Mohawk Valley Province 108
Mojave Desert, in California 421
Moore, W. C., drowned 219
Morelia, Temperature 343
Moreno, F. P., Explorations of 395
Mt. Kenia 168
Mt. Logan timber line 218
Mt. Rainier, Glaciers on 412
Mt. St. Elias 3
—— Highest camp on 226
—— Highest point reached 227
—— Timber line 218
Mt. Shasta, Timber line 218
Mt. Tacoma, Timber line 218
Mt. Whitney, Timber line 218
Mountaineering in Alaska. By Israel C. Russell. *With map* 217
Mummery, A. F., his death in the Himalayas 59
Nakchamik Island 17
Names and their Histories. By Isaac Taylor, *noticed* 73
Names Geographic, at Source of Missouri 390
Nansen, Arctic Currents 276
—— Arctic Journey 273
—— Arctic Soundings 275
—— Astronomical Determinations 276
—— Geographical Results of Voyage 274
—— Geological Observations 276
—— Hansen Search for 277
—— Highest point north 273
—— Hygienic conditions 276
—— Meteorological Observations 276
—— on Polar Travel 277

PAGE

Nansen Research Fund 397
—— Return reported 63
Natives of the North Pacific Coast like Eastern Asiatics 229
Naturalist in Mid-Africa, A. By G. F. Scott Elliot, *noticed* 305
Navassa and Swan Islands 176
Nebraska Territory formed 1854 266
Nevada Territory formed 1861 269
New Geography, The. By Albert Perry Brigham, *noticed* 195
Newell, F. H. Map of the United States, showing the Distribution of Lands, *noticed* 182
New Jersey, Relief Map of, *noticed* 423
New Mexico organized 1850 267
New York City, The Vicinity of, a field for study 148
New York included Vermont 256
New York-Pennsylvania Plateau Province 106
New York State, Climate of 125
—— Climate of, Influence of the Great Lakes upon the 128
—— Drainage of 111–115
—— Final uplift 121
—— Forest Reservation 394
—— Geographic Provinces of 110
—— Geological development of 116
—— Ice Invasion in 124
—— Isothermal line through 126
—— Physiographic features illustrated in 115
—— Physiographic Provinces of 102
—— Physical Geography of. By R. S. Tarr. *With maps* 99
—— Post-Palæozoic denudation 123
—— Rainfall in 125
—— Study of Geography of, in schools 438
—— Temperature, Mean annual 125
New Zealand Alps, A Pass over the 405
Niagara as a Time Piece. By Dr. J. W. Spencer, *noticed* 248
Nicaragua Canal 174
Nicaragua, Map of, Note on 297
Niger, French Railroad to the 398
Nile, Carte des formes de la Vie, etc., dans le Haut Nil, *noticed* 426
Niuafóu, a remarkable volcanic Island 68
Northern Boundary of the U. S. 47
North Foreland (Alaska) 12
North Pole, The next attempt on the 277
Notes and News 437
Novaya Zemlya, Geological Expedition to 163
Oaxaca, Temperature 342
Observations Météorologiques sur les Pluies Générales et les Tempêtes. Par Gaston Féral, *noticed* 195

PAGE
Ocean Travel, Loss of Life in..... 50
Oceanic Ichthyology. *Published*... 297
Ohio part of Northwestern Territory 259
Oklahoma, Development of... ... 417
Oklahoma Territory organized, 1889 267
Olai, volcano.............. 17
Ona Indians' struggle for food..... 281
Organization of the Territories..... 254
Oregon Territory organized in 1848. 270
Orleans, Henry of, in Tonkin and China........................ 60
Orleans Territory, 1804........... 258
Orography of Mexico............. 332
O'Sullivan, Henry. Exploration in Canada 55
Oxus, Diversion of the........... 398
Pachuca, Temperature........... 343
Pacific Cable, Status of the........ 44
Pacific Cables.................... 177
Pacific Ocean, Chart issued by the U. S. Hydrographic Office...... 297
Pamir, Map of the, *noticed*........ 426
Patagonia, Count Baulx in......... 281
Payart, Eugène. La Découverte du Pôle Nord, *noticed*.............. 198
Payer's Map of Franz Josef Land. 402
Peabody Museum, Memoirs of the, *noticed*........ 301
Peary Land...................... 279
Peary, R. E. Conclusions as to work in Greenland.............. 36
—— receives the Cullum Geographical Medal..................... 454
—— Work in North Greenland in 1894 and 1895. *With map*...... 21
Peary's next Expedition to Greenland............................ 170
—— return from Greenland...... 278
Penguin, her deep sounding in the Pacific..... 68
Persia, Reisen in Nord und Zentral Persien, *noticed*................ 425
Peru, Plano del Camino Central, etc., *noticed*... 187
Philafrican Liberators' League..... 71
Physical Geography of New York State, The............... 99
Physiographic features illustrated in New York................ 115
—— Materials exhibited.......... 57
—— Provinces of New York State. 102
Pigmies in East Africa............ 164
Plankton and Hydrography....... 404
Platte River, Valley of the, described 420
Point Campbell.................. 13
Point Possession................ 13
Population of Mexico..........280, 350
Population of the Argentine Republic 396
Post-Palæozoic denudations, New York State.................... 123
Profiles between Whale Sound and Independence Bay.............. 29

PAGE
Public Domain of the United States 37
Puebla, Temperature............. 342
Puget Sound and Lakes Union and Washington Canal.............. 173
Putnam, F. W., on recent Explorations in Honduras.............. 249
Queretaro, Temperature.......... 342
Races of Eastern Asia, and natives of the North Pacific Coast alike.. 229
Railroad from Merv to Kushk.. ... 282
—— lands in U. S 39
—— to the Niger, French......... 398
—— Trans-Caspian, Branch of.... 283
Railway, Intercontinental, Report on, in hand...................... 418
Rainfall in New York State....... 125
Real del Monte, Temperature..... 343
Record of Geographical Progress, 54, 157, 273, 392
Report of Justin Winsor on Venezuela-Guiana maps.............. 52
—— of the Bureau of Ethnology, 14th Annual.................... 49
—— of the Sixth International Geographical Congress, 1895, *noticed*. 299
Reservations in the United States.. 38
Rivers, South American, Bifurcations in.......... 56
Rockhill, W. W. Diary of a Journey through Mongolia and Tibet in 1891 and 1892, *noticed*........ 294
Romero, Matias. Mexico......... 327
Russell, Israel C. Lakes of North America, *noticed*............ .. 77
Russell, Israel C. Mountaineering in Alaska. *With map*... 217
Russia, Carte Hypsométrique, etc., de la Russie d'Europe, *noticed*... 425
Sahara, The Sand Dunes of....... 285
Saltillo, Temperature............. 343
Sand Dunes of the Sahara......... 285
San Luis Potosi, Temperature..... 342
Sarrauton, Henri de. L'Heure Décimale et la Division de la Circonférence, *noticed*............. 197
Schleswig's West Coast, Protection of........................... 164
Schlichter, Dr. Henry, on East African Dwarfs.................. 165
Schoolcraft's Indian Tribes of the U. S., Index of... 49
Scientific Societies of Washington, membership 53
Science Association, A New....... 437
Scott-Elliot, G. F. A Naturalist in Mid-Africa, *noticed*............ 305
Sea-Otter Rocks................. 9
—— Skins 4
Seldovia village.................. 15
Seri Indians, visited.............. 47
Ship Rock, Navigable passage at... 20
Siberian River Surveys in 1895..... 170

PAGE

Simpson, Gen. J. H., Reconnoissances of, *noticed* 293
Slave-Trade in Africa, The Internal 71
Smith, Dr. A. Donaldson, on East African Dwarfs 164
Smithsonian Institution 50 years old 290
—— Papers on Geography, *noticed*. 291
—— Publications, Catalogue of, *noticed* 295
Snow line in the tropics 218
Snow, loose, carried by wind in Greenland 30
Somaliland, Expedition in 397
Songs, Kwakiutl 234
Soundings, The deepest yet made .. 67
Sources of the Irawadi 60
South Polar Expedition, The German 67
Spencer, J. W. Niagara as a Time Piece, *noticed* 248
Spitzbergen, Ekroll's Winter in 64
Stars, a Catalogue of Southern, published 296
Staten Island Names. By William T. Davis, *noticed* 196
States; Admission of the 254
—— History of the 253
Stejneger, Leonhard, on Commander Islands and Bering Sea 414
Studenaia (Cold Bay) 16
Sunrise and Sunset Tables published by the U. S. Hydrographic Office 298
Swedish Expedition to Tierra del Fuego 160
Taconic Province 104
Tanganyika, Marine Types in 284
Tarr, Ralph S. Elementary Physical Geography, *noticed* 72
—— The Physical Geography of New York State. *With map* 99
Taylor, Isaac. Names and their Histories, *noticed* 73
Teatro della Guerra Italo- Abissina, Map of, *noticed* 186
Teatro della Guerra nel Sudan Egiziano, Map, *noticed* 187
Temperature, Mean Annual, in New York State 125
Tennessee, Agricultural Map of, *noticed* 424
Territories, Organization of the 254
Texas 252
—— Extent when admitted 258
Thacher, John Boyd. The Continent of America, Its Discovery and Its Baptism, *noticed* 193
Through Jungle and Desert; Travels in Eastern Africa. By William Astor Chanler, *noticed* 191
Thwaites, Reuben Gold. The Jesuit Relations and Allied Documents, etc. Edited by, *noticed* 428
ibet, Mr. and Mrs. Littledale in .. 61

PAGE

Tides of the Bay of Fundy 394
Tierra del Fuego, The Swedish Expedition to 160
Timber in Glacial Lake Beaches ... 280
Timber Line, Mt. Logan, etc. 218
Timbuktu, The Lake Region near .. 62
Todd, J. E. Hydraulic Gradient of the Main Artesian Basin of the Northwest, *noticed* 250
Topographic Work of the U. S. Geological Survey in 1895. By Henry Gannett. *With map* 323
Transactions of the Society, 95, 216, 455
Transvaal. Neue Special-Karte, *noticed* 186
Tree in the Dakotan Group, The. By Miss A. C. Fletcher, *noticed* .. 245
Trinidad Still Held by Brazil 281
Tūlŭm'nit Point (Castle Point) 18
Turnagain Arm, Tide in 13
Tūxed'ni Harbor (Alaska) 10
Tyonek, Village 12
Ugashik River 17
Unga 19
United States, A Graphic History of the. By Henry Gannett. *With maps* 251
—— and Territories, Outline Map of the 183
—— Area mapped in 1895 323
—— Boundary of the Northern 47
—— Boundary, Southern, in 1783. 251
—— Coast Survey Charts, Alaska .. 8
—— Coast Survey, Effort to secure State Maps 177
—— Coast Survey, Formulæ and Tables 178
—— Geological Survey in Indian Territory 180
—— Geological Survey, Monuments Posted in Wyoming 298
—— Geological Survey of the Yellowstone National Park 412
—— Geological Survey, Topographic Work of the, in 1895. By Henry Gannett. *With map* 323
—— Ground Map of the 175
—— Hydrographic Office, New Map of the Arctic Regions, etc., *noticed* 188
—— Hydrographic Office, Notes on Charts issued 297, 413
—— Map showing the Distribution of Lands 182
—— Mineral Resources of the, 1894 44
—— Physical Atlas of, proposed, 1848 291
—— Public Domain of the 37
—— Topographic Atlas, *noticed*, 181, 419
—— Trade between Mexico and, Table of 378

PAGE

United States. Western Limit of the, 1783 251
University of Pennsylvania, Publications of, sixth volume, *noticed*. 305
Upham, Warren, on Glacial Lake Agassiz, *noticed* 295
Usambara Mountains, Agricultural Station in 398
Utah Territory formed, 1850 268
Utmost Waters of the Missouri River. By J. V. Brower. *With map* 387
Vancouver's Discoveries, North-west Coast 138
Vasco da Gama celebration postponed 438
Venezuela, Botanical Map of, *noticed* 425
Virginia included Kentucky and West Virginia 256
Volcanic Island, A Remarkable 68
Washington Branch, American Institute of Archæology 52
Washington Letter 37, 173, 290, 411
—— Scientific Societies, Membership of 53
—— (Territory) formed in 1853 271
Waswanipi, Lake 55
Whale Sound and Independence Bay, Profiles between 29
Whale Sound, Northern Shores of . . 32
White Mountains, Map of the Central, *noticed* 423

PAGE

Willis, Bailey. Lecture on the Cascade Mountains 407
—— Mount Rainier Glaciers 412
Winds of the "Great Ice" in Greenland 30
Windward arrived at Vardö, Aug. 13, 1896 274
Winsor, Justin. Report on Venezuela-Guiana Maps 52
Wisconsin originally part of Michigan 262
Witskowski, B., and J. Howard Gore. Geodetic Operations in Russia, *noticed* 293
Woodward, R. S. Geographical Tables, *noticed* 294
"Woollies" (gusts of wind) 2
Work in North Greenland in 1894 and 1895, by Civ. Eng. R. E. Peary, U. S. N. *With map* 21
Wright, G. Frederick. Geological Evidence of Glacial Man at Trenton, *noticed* 249
Wyoming, Monuments in, posted by the U. S. Geological Survey 298
Yakutat, Native Settlement 4
Yangtse-Kiang, the Upper 399
Yellowstone National Park, Arnold Hague in 412
Yucatan Level Country 330
Yucatan, the Hill-Caves of. By Henry C. Mercer, *noticed* 76
Zones of Altitude in Mid-Africa 283